WILDLIFE MANAGEMENT UNIT 27R AND 29R SPECIAL STUDIES (KANAB EXCLOSURES)

There were a number of exclosures, four-way and two-way, that were relocated and repaired by the BLM from the Kanab district. They requested that permanent range trend transects be located within each of the treatments (total exclosure, livestock exclosure and outside the exclosure) in order to quantify the differences. During the 1998 field season, two, two-way exclosures and three, four-way exclosures were visited and permanent trend transects were established and read.

Trend Study 27R-1-98

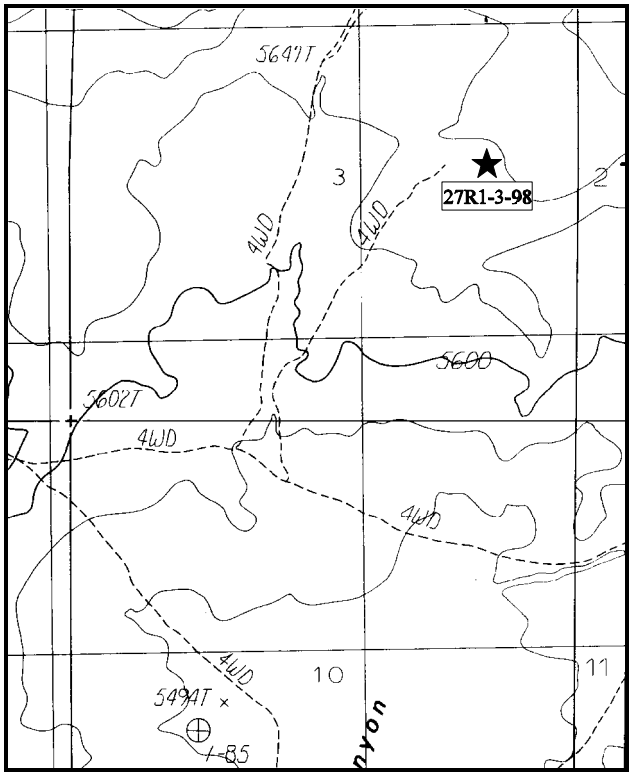
Study site name: John R. Flat Total Exclosure . Range type: Mixed Brush .

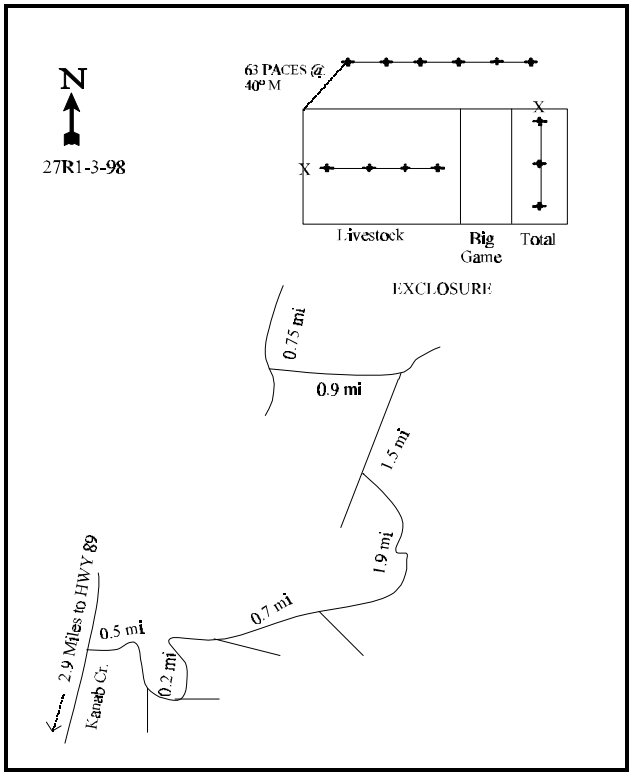
Compass bearing: frequency baseline 351° M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (34ft, 59ft, & 95 ft), line 2 (34ft & 71 ft).

LOCATION DESCRIPTION

From Kanab, travel north on Highway 89 to the Kanab Creek turnoff. Turn right and go 2.9 miles to another turnoff (you will pass the Best Friends Animal Sanctuary). Turn right, crossing Kanab Creek, and go 0.5 miles to a fork. Stay left and continue approximately 100 feet to another fork. Stay left again and continue 0.2 miles to the next fork. Stay left and continue 0.7 miles to the next fork. Stay left again and travel 1.9 miles to another fork. Go right at this fork and go 1.5 miles to another fork. At this fork, turn left, cross the drainage, and go 0.9 miles to a fork. Go right at the fork for 0.75 miles to the exclosure. The total exclosure is the section farthest to the east. The baseline runs north through the exclosure and has browse tag #114 attached to the 0 foot stake.





Map Name: White Tower

Diagrammatic Sketch

Township 42S , Range 6W , Section 3

UTM 4116533.463 N, 366419.009 E

DISCUSSION

Trend Study No. 27R-1

The John R. Flat exclosure study is new, with this transect being placed within the "total exclosure." This exclosure is located on BLM administered land, north of Kanab, and about 1-2 miles south of the White Cliffs. In 1998, permanent trend studies were established outside the exclosure, inside the livestock proof portion of the exclosure, and inside the big game/livestock proof portion of the exclosure. This portion of the study samples the area inside the big game/livestock proof section of the exclosure. The "total exclosure" area within the big game/livestock exclosure is almost half an acre in size. Aspect is to the west with a 3-5% slope. Elevation is 5,300 feet. The four-way exclosure was built in the 1960's, but has not been fully maintained. Repairs were made to the exclosure in the summer of 1998, which included repairing the fence and removing debris and/or trees, near or on the fence line. There were no big game or livestock pellet groups sampled in the big game/livestock proof portion of the exclosure, but some rabbit pellet groups were observed.

Soil textural analysis indicates it to be a sandy soil with a strongly acidic pH (5.4). Average effective rooting depth (see methods) is estimated to be 33 inches with an average soil temperature of 71°F measured at a depth of 18 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 6.8 ppm respectively, and may limit plant development. No rocks or pavement were encountered on the soil surface or within the soil profile. Much of the protective ground cover on this sites comes from litter and cryptogams. Only 2% of the vegetative cover is contributed by herbaceous understory species. Percent bare ground cover is high (42%) and some soil pedestaling was noted around shrubs. There is little erosion apparent at this time, due to the soil texture and the levelness of the site.

The browse species contribute to 98% of the vegetative cover on the site. Antelope bitterbrush, basin big sagebrush, and sand sagebrush are the most abundant browse species. Antelope bitterbrush has an estimated density of 940 plants/acre, most of which (89%) are classified as mature. Young plants make up the other 11% of the population. Average cover for antelope bitterbrush is nearly 12%. This appears to be a healthy population with no dead or decadent plants encountered. Basin big sagebrush has an estimated density of 920 plants/acre. Currently, 22% of the population is classified as decadent with 50% of these classified as dying. One seedling was encountered and 13% of the population were classified as young. Average cover for basin big sagebrush is 7%. The dead to live ratio (1:1.7) could greatly increase in the future considering the number of decadent plants that are classified as dying. Currently, 37% of the population is dead.

Sand sagebrush has an estimated density of 840 plants/acre, most of which (76%) are classified as mature. Average cover for sand sagebrush is 5%. Many seedlings, 500 plants/acre, were encountered in 1998. The population appears to be expanding as the abundance of seedlings is more than adequate to replace the few decadent and dead plants within the population. Other species scattered throughout the site include: low rabbitbrush, buckwheat, skunk bush sumac, and yucca.

The herbaceous understory is very sparse. Total cover from the grasses and forbs totals to less than one percent cover. Only one grass and six forb species were encountered in 1998. Blue grama only occurred in six of the 100 quadrats. The forbs are dominated by an annual mustard. A perennial primrose and scarlet globemallow were also encountered, but infrequently.

1998 APPARENT TREND ASSESSMENT

Although some shrubs showed pedestaling, current erosion is not readily apparent. The antelope bitterbrush population appears to be stable and healthy with no decadent or dead plants sampled. However, the basin big sagebrush population exhibits many decadent, dying, and dead plants. As there is no browsing inside the exclosure, this condition is most likely due to climatic variables, extended drought and/or with winter injury.

The herbaceous understory is nearly non-existent with only one grass and six forb species encountered in 1998.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 1

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	11	6	.08
Total for Annual Grasses		0	0	0
Total for Perennial Grasses		11	6	0.07
Total for Grasses		11	6	0.07
F	Chaenactis douglasii	2	1	.00
F	Descurainia spp. (a)	28	10	.32
F	Eriogonum cernuum (a)	2	1	.00
F	Euphorbia parryi	1	1	.00
F	Oenothera spp.	8	3	.18
F	Sphaeralcea coccinea	6	2	.01
Total for Annual Forbs		30	11	0.32
Total for Perennial Forbs		17	7	0.20
Total for Forbs		47	18	0.53

BROWSE TRENDS --
Herd unit 27R, Study no: 1

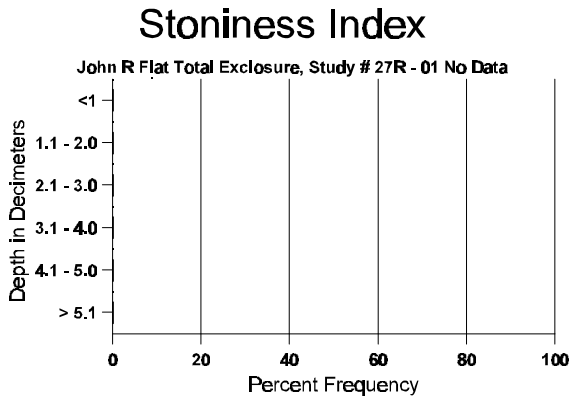
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	31	5.39
B	Artemisia tridentata tridentata	38	6.66
B	Chrysothamnus viscidiflorus	5	1.42
B	Eriogonum spp.	2	.03
B	Juniperus osteosperma	-	.03
B	Purshia tridentata	38	12.23
B	Rhus trilobata trilobata	0	.03
B	Yucca spp.	0	-
Total for Browse		114	25.80

BASIC COVER --
Herd unit 27R, Study no: 1

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	105	28.59
Litter	466	41.92
Cryptogams	174	7.93
Bare Ground	344	41.73

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 01, Study Name: John R. Flat Total Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
32.7	71.0 (17.7)	5.49	90.2	4.0	5.8	.4	6.8	3.2	.3



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 1

Type	Quadrat Frequency '98
Rabbit	8

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	23	-	-	2	-	-	-	-	-	25	-	-	-	500			25
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	32	-	-	-	-	-	-	-	-	31	-	-	-	640	36	47	32
D	98	9	-	-	-	-	-	-	-	-	3	-	-	6	180			9
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 14%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		840	Dec:		21%
Artemisia tridentata tridentata																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
M	98	29	-	-	1	-	-	-	-	-	30	-	-	-	600	44	54	30
D	98	10	-	-	-	-	-	-	-	-	5	-	-	5	200			10
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	540			27
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 11%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		920	Dec:		22%
Chrysothamnus viscidiflorus																		
M	98	6	-	-	-	-	-	-	-	-	4	-	-	-	120	41	56	6
D	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		25%
Eriogonum spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	24	41	2
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Purshia tridentata																		
Y	98	4	-	-	1	-	-	-	-	-	5	-	-	-	100			5
M	98	42	-	-	-	-	-	-	-	-	42	-	-	-	840	32	59	42
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		940	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Rhus trilobata trilobata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28	27	0

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

Yucca spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20	29	0

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

Trend Study 27R-2-98

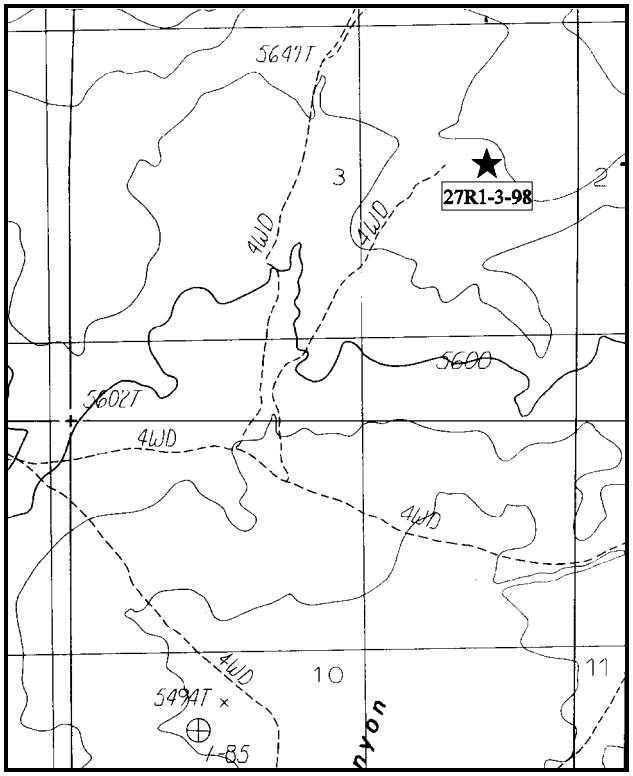
Study site name: John R. Flat Livestock Exclosure . Range type: Mixed Brush .

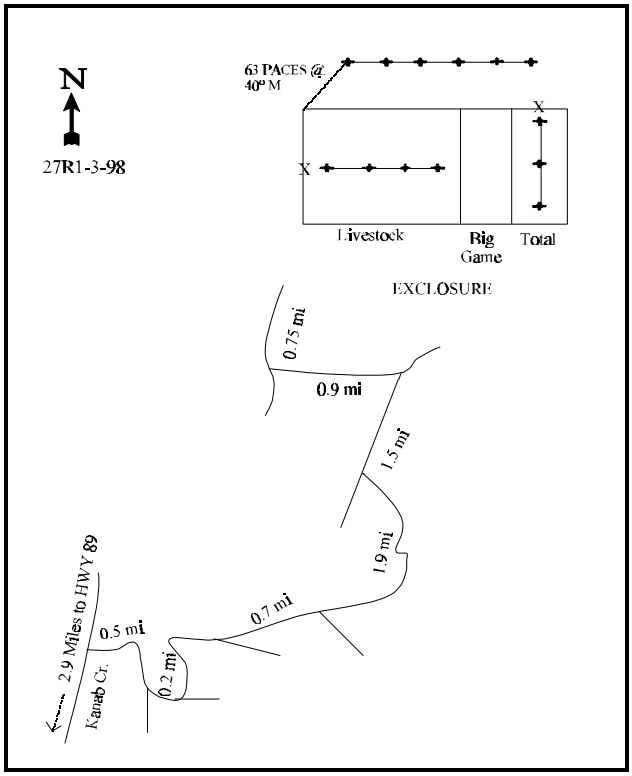
Compass bearing: frequency baseline 0 M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34 ft & 71ft).

LOCATION DESCRIPTION

From Kanab, travel north on Highway 89 to the Kanab Creek turnoff. Turn right and go 2.9 miles to another turnoff (you will pass the Best Friends Animal Sanctuary). Turn right, crossing Kanab Creek, and go 0.5 miles to a fork. Stay left and continue approximately 100 feet to another fork. Stay left again and continue 0.2 miles to the next fork. Stay left and continue 0.7 miles to the next fork. Stay left again and travel 1.9 miles to another fork. Go right at this fork and go 1.5 miles to another fork. At this fork, turn left, cross the drainage, and go 0.9 miles to a fork. Go right at the fork for 0.75 miles to the exclosure. The livestock exclosure is nearest the road (lower fence), and the baseline runs down the middle of the exclosure starting at the east side near the taller fence marking the big game exclosure. Count down to the 11th post in from either side to the 0 foot stake.





Map Name: White Tower

Diagrammatic Sketch

Township 42S , Range 6W , Section 3

UTM 4116566.954 N, 366374.242 E

DISCUSSION

Trend Study No. 27R-2

The is another new trend study placed within the livestock exclosure at John R Flat. The exclosure is located on BLM administered land, north of Kanab, and about 1-2 miles south of the White Cliffs. In 1998, permanent trend studies were established outside the exclosure, within the livestock proof portion of the exclosure, and within the big game/livestock proof portion of the exclosure. This study samples the area inside the livestock proof portion of the exclosure. The area within the livestock exclosure is almost 1.4 acres (approximately 60,000 ft^2). Aspect is to the west with a 3-5% slope. Elevation is 5,300 feet. The four-way exclosure was built in the 1960's, but has not been maintained for many years. Repairs were made to the exclosure in the summer of 1998, this included repairing the fence and removing debris and/or trees along the fence line. A pellet group transect shows abundant deer sign within the livestock exclosure with an estimated 114 deer days use/acre. Additionally, some rabbit pellet groups were observed.

Soil textural analysis indicates it to be a sand soil with a strongly acidic pH (5.4). Average effective rooting depth (see methods) was estimated to be 27 inches with an average soil temperature of 72°F at 18 inches. Both potassium and phosphorous measurements were low, 6.4 ppm and 7.7 ppm respectively, and may limit plant development. No rocks or pavement were encountered on the soil surface or within the soil profile. The soil appeared to be more compacted underneath the shrubs than in the bare interspaces. Much of the protective ground cover on this sites comes from litter and cryptogams. Only 6% of the vegetative cover is contributed by herbaceous understory species. Although percent bare ground cover is high (42%), due to the soil texture and the lack of slope, there is little erosion apparent at this time.

The browse species provide 94% of the vegetative cover on the site. Antelope bitterbrush, basin big sagebrush, and sand sagebrush are the most abundant browse species. Basin big sagebrush has an estimated density of 4,380 plants/acre. This appears to be a more stable population than the “total” exclosure with more young individuals encountered (1,920 plants/acre) than mature plants (1,860 plants/acre). The biotic potential is fairly good at this time with an estimated 180 seedling plants/acre. Currently, 14% of the population were classified as decadent and 50% of these classified as dying. Average cover for basin big sagebrush is 10%. The dead to live ratio is currently 1:3.8, or 21% of the population is dead. Utilization is light with only 5% of the population exhibiting poor vigor.

Antelope bitterbrush has an estimated density of 980 plants/acre. Mature plants make up 61% of the population, while young plants make up 37% of the population. Average cover for antelope bitterbrush is 5%. Utilization is light and the plants exhibit good vigor leader growth of about 6-8 inches this year. This appears to be a healthy population with only one decadent plant and no dead ones encountered. Sand sagebrush has an estimated density of 480 plants/acre, most of which (75%) were classified as mature. Average cover for sand sagebrush is 1.5%. Biotic potential is high with an estimated 100 seedling plants/acre encountered in 1998. This abundance of seedlings is adequate to replace the few decadent and dead plants lost from the population. Point-center quarter data estimated 27 juniper trees/acre. Other species scattered throughout the site include: a low elevation form of mountain big sagebrush, rubber rabbitbrush, skunk bush sumac, green ephedra, and yucca.

The herbaceous understory is sparse, as indicated by a total cover of just over 1%. Three grass and 7 forb species were encountered in 1998. Blue grama was the most abundant, but it was only found in 4 quadrats. Other grasses include purple threeawn and six weeks fescue. The forbs were dominated by the annual nodding eriogonum. Most other forb species were only encountered in one quadrat.

1998 APPARENT TREND ASSESSMENT

Although there is little protective ground cover provided by herbaceous species at this time, there is currently little erosion apparent on the site. The basin big sagebrush population appears to be stable at this time with many healthy, young plants encountered. The antelope bitterbrush population also appears to be stable and healthy with only one decadent plant sampled and no dead plants found. Utilization of basin big sagebrush and Antelope bitterbrush is light with few plants exhibiting poor vigor. The herbaceous understory is nearly non-existent with only 2 grass and 7 forb species encountered.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 2

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	3	2	.18
G	Bouteloua gracilis	11	4	.33
G	Vulpia octoflora (a)	2	1	.00
Total for Annual Grasses		2	1	0.00
Total for Perennial Grasses		14	6	0.51
Total for Grasses		16	7	0.51
F	Artemisia dracunculus	2	1	.03
F	Draba spp. (a)	2	1	.00
F	Eriogonum cernuum (a)	132	51	.66
F	Euphorbia albomarginata	10	4	.02
F	Gilia spp. (a)	1	1	.00
F	Oenothera spp.	1	1	.00
F	Sphaeralcea grossulariaefolia	1	1	.03
Total for Annual Forbs		135	53	0.67
Total for Perennial Forbs		14	7	0.08
Total for Forbs		149	60	0.75

BROWSE TRENDS --
Herd unit 27R, Study no: 2

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	18	1.50
B	Artemisia tridentata tridentata	74	10.03
B	Artemisia tridentata wyomingensis	1	-
B	Chrysothamnus nauseosus	3	.15
B	Ephedra viridis	0	-
B	Gutierrezia sarothrae	0	-
B	Juniperus osteosperma	1	3.12
B	Purshia tridentata	38	5.48
B	Rhus trilobata trilobata	0	-
B	Yucca spp.	1	.38
Total for Browse		136	20.67

CANOPY COVER --
Herd unit 27R, Study no: 2

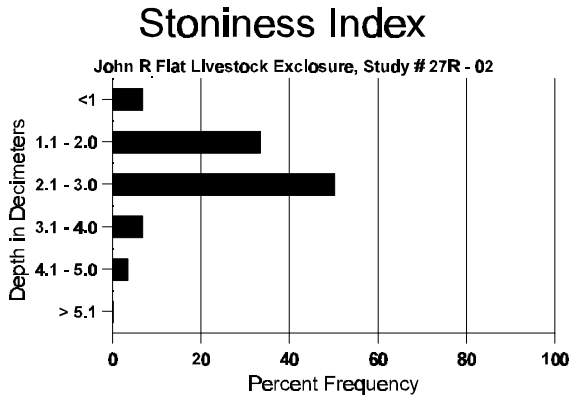
Species	Percent Cover '98
Juniperus osteosperma	5
Purshia tridentata	1

BASIC COVER --
Herd unit 27R, Study no: 2

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	202	22.86
Litter	480	47.95
Cryptogams	112	4.34
Bare Ground	380	42.29

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 02, Study Name: John R. Flat Cattle Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
26.8	72.0 (17.7)	5.4	90.2	4.0	5.8	.6	7.7	6.4	.3



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 2

Type	Quadrat Frequency '98
Rabbit	9
Elk	5
Deer	46

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	16	1	-	1	-	-	-	-	-	18	-	-	-	360	27	29	18
D	98	5	-	-	-	-	-	-	-	-	4	-	-	1	100			5
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	04%	00%	04%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	480	Dec:	21%

Artemisia tridentata tridentata																		
S	98	9	-	-	-	-	-	-	-	-	9	-	-	-	180			9
Y	98	69	19	-	6	-	-	2	-	-	96	-	-	-	1920			96
M	98	49	32	3	8	1	-	-	-	-	93	-	-	-	1860	33	37	93
D	98	15	1	-	9	2	2	1	-	-	20	-	-	10	600			30
X	98	1	-	-	-	-	-	-	-	-	1	-	-	-	1160			58

% Plants Showing '98	Moderate Use	Heavy Use	Poor Vigor	%Change
	25%	02%	05%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	4380	Dec:	14%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Chrysothamnus nauseosus																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	32	45	1
D	98	3	-	-	-	-	-	-	-	-	1	-	-	2	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 50%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		75%
Ephedra viridis																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	45	83	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	10	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Juniperus osteosperma																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
Y	98	13	1	-	3	1	-	-	-	-	18	-	-	-	360			18
M	98	18	7	-	2	3	-	-	-	-	28	2	-	-	600	36	50	30
D	98	-	-	-	-	1	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98				Moderate Use 27%			Heavy Use 00%			Poor Vigor 02%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		980	Dec:		2%
Rhus trilobata trilobata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	87	132	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Yucca spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	46	41	1

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings)	'98	20	Dec:	-

Trend Study 27R-3-98

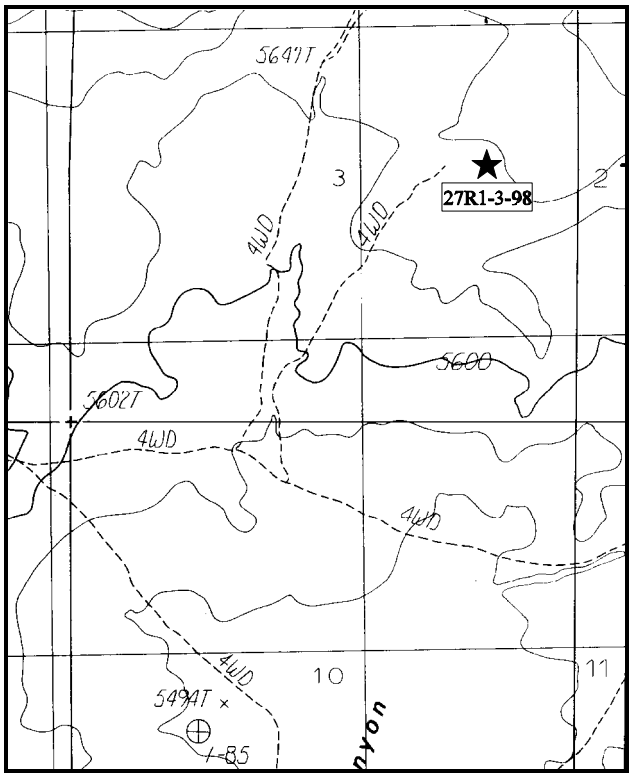
Study site name: John R. Flat Outside . Range type: Mixed Brush .

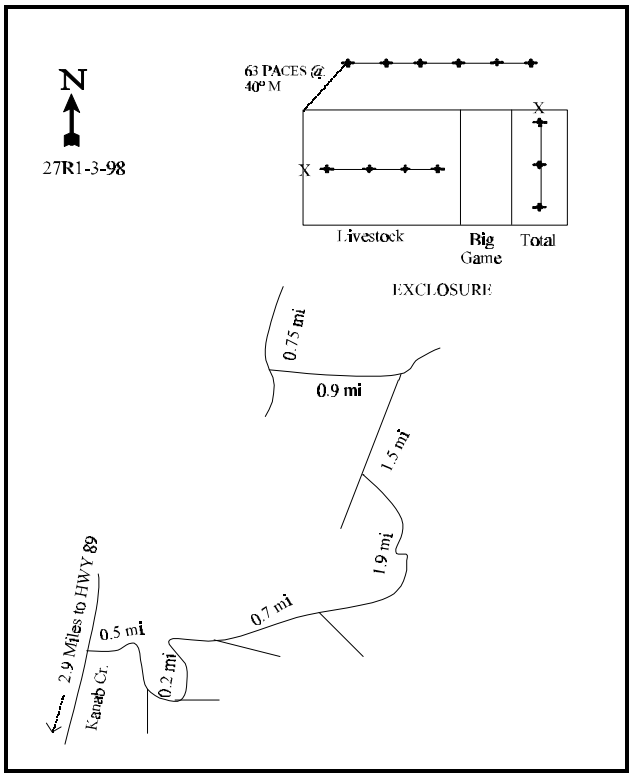
Compass bearing: frequency baseline 100°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1(11 ft) , line 2(34 ft) , line 3(59 ft) , line 4(71 ft) , line 5(95 ft).

LOCATION DESCRIPTION

From Kanab, travel north on Highway 89 to the Kanab Creek turnoff. Turn right and go 2.9 miles to another turnoff (you will pass the Best Friends Animal Sanctuary). Turn right, crossing Kanab Creek, and go 0.5 miles to a fork. Stay left and continue approximately 100 feet to another fork. Stay left again and continue 0.2 miles to the next fork. Stay left and continue 0.7 miles to the next fork. Stay left again and travel 1.9 miles to another fork. Go right at this fork and go 1.5 miles to another fork. At this fork, turn left, cross the drainage, and go 0.9 miles to a fork. Go right at the fork for 0.75 miles to the exclosure. From the northwest corner of the exclosure, walk 63 paces at an azimuth of 40° M to the 0 foot stake of the baseline. The baseline runs at 100°M.





Map Name: White Tower

Diagrammatic Sketch

Township 42S , Range 6W , Section 3

UTM NO GPS

DISCUSSION

Trend Study No. 27R-3

This is a new trend study placed outside the exclosure at the John R. Flat exclosure. The exclosure is located on BLM administered land, north of Kanab, and about 1-2 miles south of the White Cliffs. Permanent trend studies were established outside the exclosure, within the livestock proof portion of the exclosure, and within the big game/livestock proof portion of the exclosure in 1998. This transect is located outside of the exclosure. Aspect is to the west with a 3-5% slope. Elevation is 5,300 feet. The four-way exclosure was built in the 1960's, but has not been maintained for many years. Repairs were made to the exclosure in the summer of 1998, this included repairing the fence and removing debris and/or trees along the fence line. A pellet group transect showed abundant deer and rabbit sign with an estimated 34 deer days use/acre.

Soil textural analysis indicates it to be a sand soil with a moderately acidic pH (5.6). Average effective rooting depth (see methods) is estimated to be 29 inches with an average soil temperature of 73°F at 18 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 5.1 ppm respectively, and may limit plant development. Rocks and pavement were rarely encountered on the soil surface and not encountered within the soil profile. Percent bare ground cover is high (61%) and some soil pedestaling was noted around shrubs. There is little erosion apparent at this time due to the soil texture and the levelness of the site.

The browse species provide 62% of the vegetative cover on the site. Basin big sagebrush, sand sagebrush, and antelope bitterbrush are the most abundant browse species. Basin big sagebrush has an estimated density of 1,540 plants/acre. This appears to be a declining population with 53% of the population classified as decadent and a dead to live ratio of 1:1. Currently, 37% of the decadent plants are classified as dying. No seedlings were found, therefore biotic potential in 1998 was zero. Young plants make up 10% of the population and mature plants make up 36% of the population. Average cover for basin big sagebrush is 4%. Utilization is light to moderate and 19% of the population exhibit poor vigor. Use is significantly higher than that in the livestock proof portion of the exclosure.

Sand sagebrush has an estimated density of 380 plants/acre, most of which (79%) are classified as mature. Average cover for sand sagebrush is 1%. This appears to a stable population as the number of seedlings is adequate to replace the few decadent and dead plants that are being lost. Antelope bitterbrush has an estimated density of 240 plants/acre. Mature plants make up 50% of the population and young plants make up the other 50% of the population. Average cover for antelope bitterbrush is nearly 2%. Utilization is light and the plants exhibit good vigor this year. This appears to be a stable, healthy population with no decadent or dead plants encountered. Point-center quarter data estimates 27 juniper trees/acre. Other species scattered throughout the site include: rubber rabbitbrush, skunk bush sumac, green ephedra, buckwheat, broom snakeweed, prickly pear cactus, and yucca.

The herbaceous understory provides 38% of the vegetative cover, or a total of just over 5% cover. Grasses provide 64% of the herbaceous understory cover. Blue grama is the most abundant grass providing about 2% cover. Other perennial grasses include: sand dropseed, Indian ricegrass, and sandhill muhly. Six weeks fescue, an annual, was encountered but provides much less than 1% cover. The forbs were dominated by the annual nodding eriogonum. Tarragon is the most abundant perennial forb found in 11 quadrats.

1998 APPARENT TREND ASSESSMENT

Although some pedestaling was noted around some of the shrubs, there is currently no serious erosion apparent on the site. The basin big sagebrush population appears to be declining at this time with 53% of the population classified as decadent, a dead to live ratio of 1:1, and no seedling plants encountered. The antelope bitterbrush population appears to be stable and healthy with only no decadent or dead plants

encountered. Utilization of antelope bitterbrush is light with all exhibiting good vigor. The herbaceous understory cover is poor and provides little protective ground cover.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 3

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	37	16	1.95
G	Muhlenbergia pungens	8	3	.78
G	Oryzopsis hymenoides	6	3	.06
G	Sporobolus cryptandrus	20	8	.40
G	Vulpia octoflora (a)	25	10	.05
Total for Annual Grasses		25	10	0.05
Total for Perennial Grasses		71	30	3.21
Total for Grasses		96	40	3.25
F	Artemisia dracunculus	17	11	.77
F	Chaenactis douglasii	13	6	.36
F	Eriogonum cernuum (a)	115	49	.53
F	Euphorbia parryi	6	3	.04
F	Gilia spp. (a)	5	3	.04
F	Machaeranthera canescens	-	-	.00
F	Oenothera pallida	4	2	.04
F	Sphaeralcea parvifolia	1	1	.00
Total for Annual Forbs		120	52	0.57
Total for Perennial Forbs		41	23	1.22
Total for Forbs		161	75	1.79

BROWSE TRENDS --
Herd unit 27R, Study no: 3

Type	Species	Average Cover % '98
B	Artemisia filifolia	.75
B	Artemisia tridentata tridentata	3.83
B	Chrysothamnus nauseosus	.73
B	Ephedra viridis	.58
B	Eriogonum spp.	.03
B	Gutierrezia sarothrae	-
B	Juniperus osteosperma	.15
B	Opuntia spp.	-
B	Purshia tridentata	2.19
B	Rhus trilobata trilobata	-
B	Yucca spp.	-
Total for Browse		8.29

CANOPY COVER --
Herd unit 27R, Study no: 3

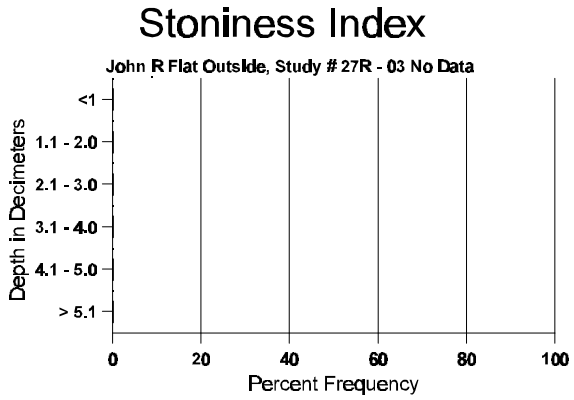
Species	Percent Cover '98
Juniperus osteosperma	2

BASIC COVER --
Herd unit 27R, Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	211	14.82
Rock	1	.00
Pavement	2	.00
Litter	459	28.68
Cryptogams	128	6.28
Bare Ground	439	60.68

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 03, Study Name: John R. Flat Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
29.4	72.6 (17.7)	5.6	92.2	2.0	5.84	.5	5.1	3.2	.2



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 3

Type	Quadrat Frequency '98
Rabbit	17
Elk	1
Deer	33

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	14	-	-	1	-	-	-	-	-	15	-	-	-	300	22	22	15
D	98	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 05%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98	380	Dec:			11%
Artemisia tridentata tridentata																		
Y	98	6	1	1	-	-	-	-	-	-	8	-	-	-	160			8
M	98	8	14	4	2	-	-	-	-	-	28	-	-	-	560	27	35	28
D	98	16	18	1	3	2	1	-	-	-	26	-	-	15	820			41
X	98	1	-	-	-	-	-	-	-	-	1	-	-	-	1480			74
% Plants Showing '98				Moderate Use 45%			Heavy Use 09%			Poor Vigor 19%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98	1540	Dec:			53%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	6	-	-	1	-	-	-	-	-	7	-	-	-	140	29	41	7
D	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		200	Dec:		20%
Ephedra viridis																		
S	98	-	-	-	2	-	-	-	-	-	2	-	-	-	40			2
Y	98	-	1	-	-	4	-	-	-	-	5	-	-	-	100			5
M	98	2	1	-	-	-	-	-	-	-	3	-	-	-	60	44	63	3
% Plants Showing '98		Moderate Use 75%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		-
Eriogonum spp.																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	13	22	2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Gutierrezia sarothrae																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	8	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	5	13	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
Y	98	4	-	-	-	2	-	-	-	-	6	-	-	-	120			6
M	98	5	1	-	-	-	-	-	-	-	6	-	-	-	120	40	65	6
% Plants Showing '98		Moderate Use 25%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		240	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Rhus trilobata trilobata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	30	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

Yucca spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	30	25	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)	'98	0	Dec:	-

JOHN R. FLAT EXCLOSURE COMPARISON SUMMARY

Total Exclosure 27R-1, Livestock Exclosure 27R-2, and Outside 27R-3

1998 Comparisons

Ground cover characteristics differ between outside and inside the exclosure. Percent bare ground cover is highest outside of the exclosure (61%) and almost the same in both the livestock and total exclosure (42%). Vegetation cover is greatest in the total exclosure (29%), dropping down slightly in the livestock exclosure (23%), and at its lowest value outside the exclosure (15%). Litter cover is highest in the livestock and total exclosures and again the lowest outside.

Soil characteristics are very similar between all treatments. Soils are a moderately deep with very sandy textures and understandably low organic matter content. Although the pH inside the exclosure is classified as strongly acidic and outside the exclosure the pH is classified as moderately acidic, there is not that large of a difference between the two, 5.4 inside and 5.6 outside. Very little erosion is occurring on any of the sites due to the soil texture and the levelness of the site. Phosphorous and potassium levels are low for all sites and may limit plant development. Soil temperatures differ by only 1.6°F (71.0-72.6) between all sites.

Basin big sagebrush density is similar between the total exclosure (920 plants/acre) and outside the exclosure (1,540 plants/acre). The livestock exclosure has a higher density with an estimated 4,380 plants/acre where 45% of the plants are classified as young. The sagebrush stand outside the exclosure is the least healthy with 53% of the population classified as decadent. The total exclosure has decadency rate of 22% and the livestock exclosure has a decadency rate of 14%. Those with poor vigor follow the same pattern, with the highest outside the exclosure, and the lowest in the livestock exclosure. Utilization is light to moderate outside and mostly light in the livestock exclosure (45% vs 25% for those with moderate use). However, deer days use/acre is highest in the livestock exclosure compared to the outside (114 ddu/acre vs 33 ddu/acre) where the sagebrush is in the best condition. Because of the relatively high number of dead plants and decadent sagebrush plants in the total exclosure, this would indicate that other “effects” are causing the downward trends for sagebrush. It should be noted that sagebrush are more susceptible to winter injury than any other shrub species occurring on the site. This injury is caused when the shrub is under extended periods of drought stress, which is intensified by the high percentage of sand in the soil and the depth of the soil. When they are under this kind of stress, and in conjunction with mild winters, they would break dormancy and begin growth very early in the year. Doing so, any substantial length of time with very cold night time temperatures will cause desiccation and death within the shrub crowns for there is no available moisture within the deep sandy soil to carry out photosynthesis. This effect would be aggravated by moderate duel use on the outside of the exclosure, causing even higher death rates and higher rates of decadency.

The bitterbrush populations are similar over all grazing effects. No seedlings were encountered on any treatment. However, the outside and the livestock exclosure had more young plants relative to the total exclosure. Utilization is light on the outside and within the livestock exclosure. Sand sagebrush density is highest in the total exclosure (840 plants/acre) and similar in the livestock (480 plants/acre) and outside (380 plants/acre). These plants exhibit no utilization and are comprised of mostly mature plants.

Outside the exclosure had the highest herbaceous understory cover (5%), followed by the livestock exclosure (1.25%), and then the total exclosure (0.6%). Herbaceous understory species richness is highest outside with 13 species encountered. The livestock exclosure has 10 species and the total exclosure has 7 species. Annual species dominate in the livestock exclosure while perennial species dominate outside. Perennial and annual are of nearly equal abundance in the total exclosure.

Grass species account for 64% of the herbaceous understory cover outside, 40% in the livestock exclosure, and 12% inside the “total” exclosure. Blue grama is present on all sites. Six weeks fescue is present in the

livestock exclosure and outside. Sandhill muhly, Indian ricegrass, and sand dropseed are only present in the outside. Forbs are dominated by annuals on all sites; nodding eriogonum outside and in the livestock exclosure, and Descurainia sp. in the total exclosure.

Trend Study 27R-4-98

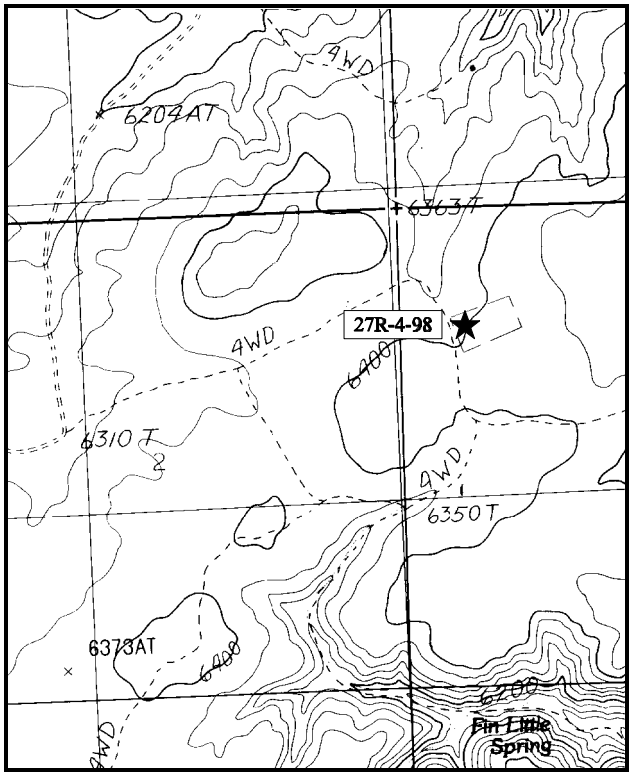
Study site name: Nephi Pasture Total Exclosure . Range type: Mixed Brush .

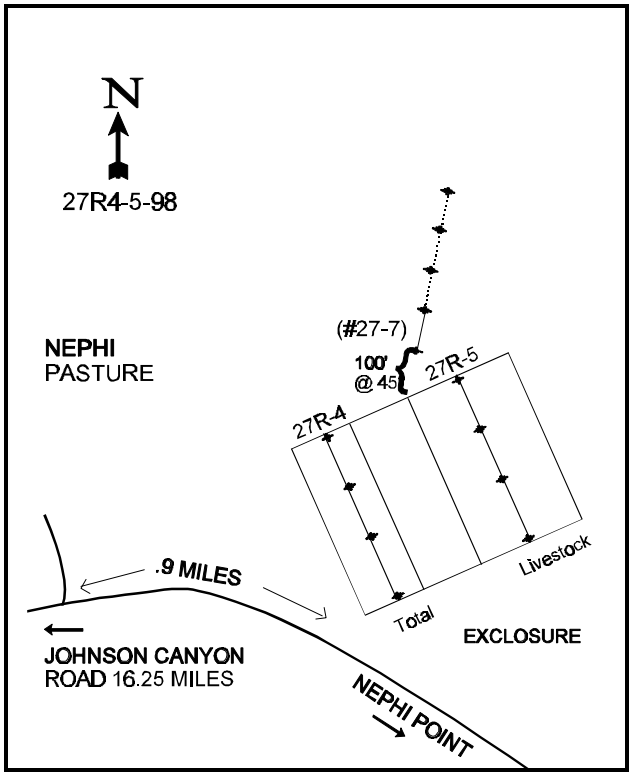
Compass bearing: frequency baseline 142°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34 ft & 71 ft).

LOCATION DESCRIPTION

From Kanab, take US 9 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right. Go 16.25 miles (see 27-6-97 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an exclosure. From the northwest corner of the exclosure, count up five posts to the 0 foot baseline on the inside of the exclosure. The baseline runs at an azimuth of 142° M.





Map Name: Nephi Point Diagrammatic Sketch

Township 42S , Range 4W , Section 1 UTM 4116576.213 N, 394201.102 E

DISCUSSION

Trend Study No. 27R-4

This is a new study placed within the Nephi Pasture total exclosure. The Nephi exclosure is a 3 way (total, livestock, and open grazing effects) exclosure established in the 1960's. Trend study 27R-5 samples the livestock exclosure and study 27-7 is an existing trend study established in 1987, sampling outside of the exclosure. The area supports a mixed shrub community with a scattered overstory of pinyon and juniper trees. Slope is 13% with a northwest aspect. Elevation is approximately 6,400 feet. Deer generally utilize the area at high levels during the winter. They have also gotten into the total exclosure, due to a hole in the fence and moderately hedged many of the preferred shrubs.

Soil in the exclosure is a fairly deep sandy loam with a moderately acid pH (5.9). Effective rooting depth (see methods) is estimated at almost 23 inches. Phosphorus and potassium appear to be limiting to plant growth at just 8.2 ppm and 25.6 ppm respectively. Values higher than 10 ppm for phosphorus and 70 ppm for potassium are considered minimal for normal plant development. There is virtually no rock or pavement on the surface or within the soil profile. Some soil pedestaling is evident, but there is very little erosion occurring inside of the exclosure.

The total exclosure supports a moderately dense stand of basin big sagebrush which provides half of the shrub cover on the site. Antelope bitterbrush is also fairly abundant, providing an additional 38% of the shrub cover. Serviceberry is found inside the total exclosure but at far lower numbers compared to the livestock exclosure and outside. The sagebrush displays light to moderate use due to the poorly maintained fence. Density is estimated at 2,820 plants/acre, 64% of which are decadent. Dead plants are numerous and account for 42% of the population. In addition, 72% of the decadent sagebrush appear to by dying indicating the possibility of 1,300 additional plants being eliminated from the population in the near future. Reproduction is poor with no seedlings sampled and young plants account for only 12% of the population. This would not be enough to maintain the population at current levels. Taking these factors into account, it appears that the sagebrush population is in a state of serious decline.

Bitterbrush, meanwhile, appears to have a stable population of approximately 920 plants/acre. Use is light to moderate, vigor good, and percent decadence low at only 2%. No seedlings were encountered, but 20% of the population consists of young plants. Serviceberry has a population of only 80 plants/acre. They show no use, good vigor, and low decadence at 25%. There is a moderately dense stand of broom snakeweed. It has an estimated population density of 1,580 plants/acre. However, 92% of the plants are mature and the population appears stable.

The herbaceous understory is moderately abundant, providing 17% cover. There are 7 perennial grasses found in the total exclosure, however annuals, cheatgrass and six weeks fescue, dominate by providing 72% of the grass cover. In fact, cheatgrass is most abundant inside of the total exclosure compared to the livestock exclosure and outside. The most common perennial grass is needle-and-thread which occurs in low numbers outside of the total exclosure. Western wheatgrass and Sandberg bluegrass are also fairly common. Forb diversity and abundance are similar, when compared to the livestock exclosure. Bastard toadflax and wooly plantain are the most abundant species.

1998 APPARENT TREND ASSESSMENT

The soil appears to be stable with limited erosion occurring. Ground cover characteristics differ slightly compared to the livestock exclosure. Percent vegetative cover is 41% compared to 47% in the livestock exclosure. Litter cover is much lower at 43% in the total exclosure compared to 67% in the livestock exclosure. However, percent bare ground is similar at 23%. Trend for the key browse species, basin big sagebrush, appears to be declining. Percent decadence is high at 64% with 72% (1,300 plants/acre) of the

decadent sagebrush classified as dying. Reproduction is poor with no seedlings found and only 12% (340 plants/acre) of the population consisting of young plants. Even though this is suppose to be a total exclosure, the fence is not well maintained. The deer have light to moderate use on some of the sagebrush and bitterbrush. This use does not appear to be the cause for the poor condition of sagebrush however. Use is higher in the livestock exclosure, but the sagebrush there are much healthier. Trend for bitterbrush and serviceberry in the total exclosure appear stable. The herbaceous understory is similar in composition and abundance to the livestock exclosure, although annual grasses are more abundant providing 72% of the grass cover. The only fairly common perennial grass is needle-and-thread, which is found in low numbers in the livestock exclosure and outside. Forb composition is similar to the livestock exclosure with bastard toadflax and wooly plantain being the most abundant.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 4

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron smithii	56	20	.76
G	Agropyron spicatum	2	1	.03
G	Bromus tectorum (a)	321	79	7.44
G	Oryzopsis hymenoides	3	2	.18
G	Poa secunda	37	16	.43
G	Sitanion hystrix	8	3	.04
G	Sporobolus cryptandrus	3	2	.06
G	Stipa comata	60	18	1.92
G	Vulpia octoflora (a)	144	46	1.41
Total for Annual Grasses		465	125	8.85
Total for Perennial Grasses		169	62	3.44
Total for Grasses		634	187	12.29
F	Comandra pallida	167	61	3.32
F	Descurainia pinnata (a)	11	3	.07
F	Eriogonum cernuum (a)	5	2	.03
F	Erigeron spp.	6	2	.06
F	Lupinus spp.	5	2	.18
F	Microsteris gracilis (a)	6	2	.03
F	Phlox austromontana	4	1	.03
F	Plantago patagonica (a)	66	21	.76
F	Polygonum douglasii (a)	3	1	.00
F	Sphaeralcea coccinea	1	1	.00
Total for Annual Forbs		91	29	0.90
Total for Perennial Forbs		183	67	3.60
Total for Forbs		274	96	4.51

BROWSE TRENDS --
Herd unit 27R, Study no: 4

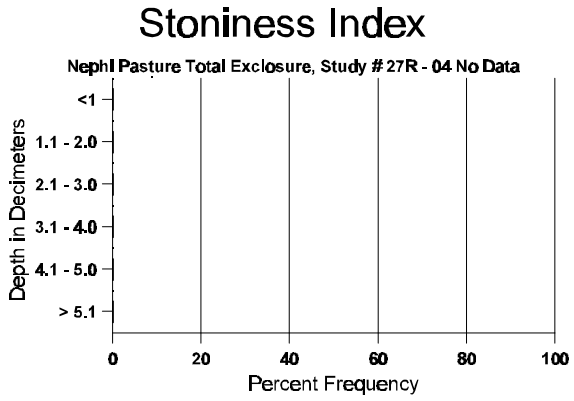
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	4	1.03
B	Artemisia tridentata tridentata	73	10.35
B	Cercocarpus montanus	0	-
B	Gutierrezia sarothrae	35	1.42
B	Juniperus osteosperma	2	-
B	Opuntia spp.	1	.03
B	Purshia tridentata	30	7.90
Total for Browse		145	20.73

BASIC COVER --
Herd unit 27R, Study no: 4

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	431	41.18
Pavement	8	.01
Litter	478	41.79
Cryptogams	225	11.46
Bare Ground	270	23.23

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 04, Study Name: Nephi Pasture Total Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
22.7	68.8 (17.7)	5.9	74.2	18.0	7.8	.7	8.2	25.6	.4



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 4

Type	Quadrat Frequency '98
Rabbit	14
Elk	1
Deer	22

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 4

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	88	103	2
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		80	Dec:		25%
Artemisia tridentata tridentata																		
Y	98	15	-	-	2	-	-	-	-	-	17	-	-	-	340			17
M	98	28	5	-	1	-	-	-	-	-	34	-	-	-	680	32	37	34
D	98	50	40	-	-	-	-	-	-	-	25	-	-	65	1800			90
X	98	6	-	-	-	-	-	-	-	-	8	-	-	-	2020			101
% Plants Showing '98				Moderate Use 32%			Heavy Use 00%				Poor Vigor 46%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2820	Dec:		64%
Cercocarpus montanus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	49	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
Y	98	3	-	-	1	-	-	-	-	-	4	-	-	-	80			4
M	98	65	-	-	8	-	-	-	-	-	73	-	-	-	1460	10	11	73
D	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 03%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1580	Dec:		3%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
Y	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Opuntia spp.																		
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 100%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%
Purshia tridentata																		
Y	98	6	1	-	2	-	-	-	-	-	9	-	-	-	180			9
M	98	23	12	-	1	-	-	-	-	-	36	-	-	-	720	35	51	36
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98				Moderate Use 28%			Heavy Use 00%				Poor Vigor 02%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		920	Dec:		2%

Trend Study 27R-5-98

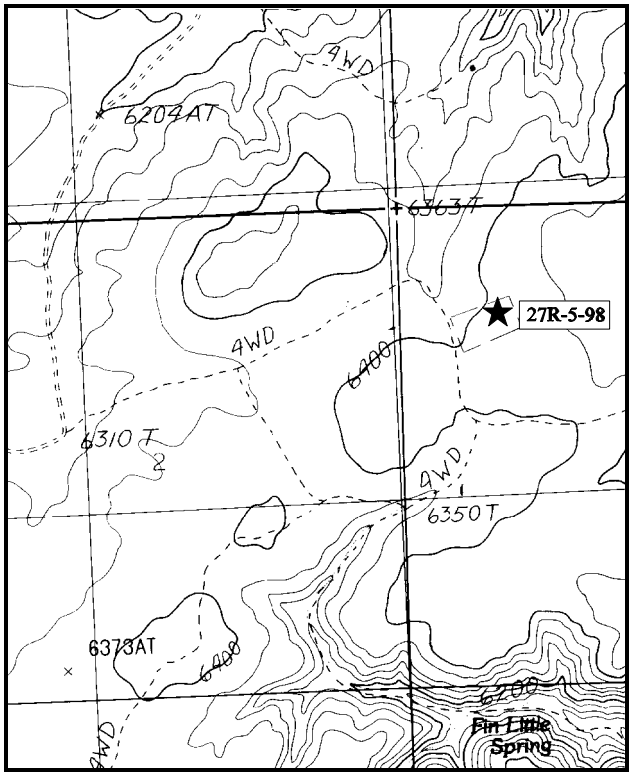
Study site name: Nephi Pasture Livestock Exclosure. Range type: Mixed Brush .

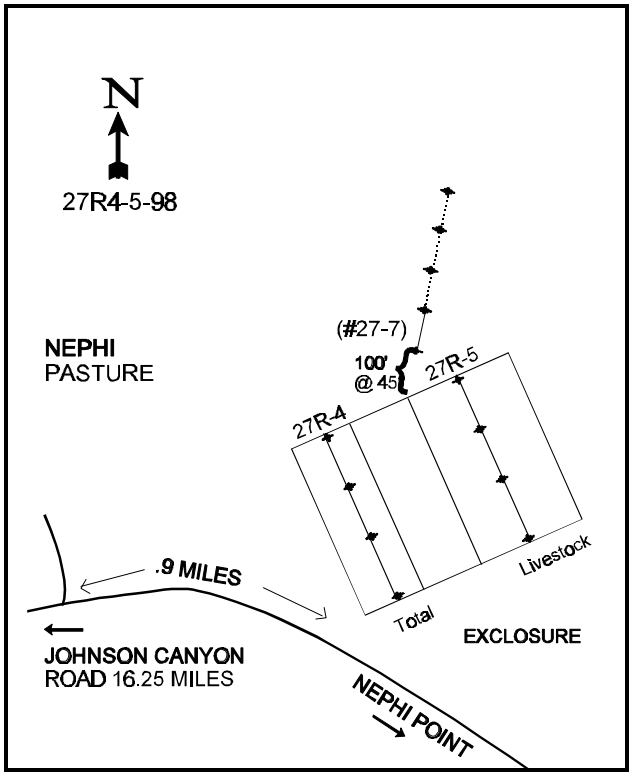
Compass bearing: frequency baseline 147°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34ft & 71 ft).

LOCATION DESCRIPTION

From Kanab, take US 9 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right. Go 16.25 miles (see 52-6-87 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an exclosure. Walk east along the fence on the north side of the exclosure to the beginning of the livestock exclosure (lower fence). From here, walk down to the midpoint of the fenceposts. The baseline starts on the inside of the livestock exclosure at the midpoint, and runs at an azimuth of 147° M.





Map Name: Nephi Point

Diagrammatic Sketch

Township 42S , Range 4W , Section 1

UTM 4116617.355 N,394320.115 E

DISCUSSION

Trend Study No. 27R-5

This is a new trend study placed within the Nephi Pasture livestock exclosure. It is within 300 feet of the Nephi Pasture Exclosure trend study 27-7, which samples outside of the exclosure. The livestock exclosure is approximately 200 feet by 300 ft in size, about 1.4 acres. Slope varies from 5% to 10% with a northwest aspect. Elevation is about 6,400 feet. Deer utilize this exclosure heavily with deer days use/acre estimated at 111. All pellet groups appeared to be from the previous winter.

Soil in the livestock exclosure is very similar to the outside. Effective rooting depth (see methods) is estimated at just over 20 inches with a compacted layer encountered at that depth. Soil texture is a sand with a moderately acid pH (5.8). Phosphorus and potassium may be limiting to plant development and growth at 6.9 ppm and 12.8 ppm respectively. Minimum values for phosphorus are 10 ppm and 70 ppm for potassium. Rock and pavement are rare on the surface and within the profile. Erosion appears minimal.

The livestock exclosure supports nearly twice as much shrub cover as what is found outside (27% vs 15%). Key species include: basin big sagebrush, Utah serviceberry, and antelope bitterbrush. Sagebrush is most abundant, providing 40% of the browse cover, while serviceberry and bitterbrush account for respectively 24% and 20%. Density of sagebrush is estimated at 3,340 plants/acre, 43% of which are mature. Utilization is light to moderate with 13% of the plants displaying heavy use. Percent decadence is 34% with half of these plants classified as dying. Reproduction is good however, with enough young plants to replace decadent/dying individuals. Dead plants are abundant at 1,480 plants/acre or 30% of the population. But this is lower than either the total exclosure (42%) or the outside (43%).

Serviceberry numbers 740 plants/acre, 62% of which are mature. These shrubs show light to moderate use where available. Vigor is generally good and percent decadence is low at 11%. Bitterbrush has a density of 800 plants/acre. These plants also show light to moderate use suggesting that the extremely heavy use outside the exclosure is due to dual cow/deer utilization. Vigor is generally normal and percent decadence is low at only 10%. Reproduction is more than adequate to maintain the population.

The only other common shrub in the livestock exclosure is broom snakeweed which has an estimated population density of 1,780 mostly mature plants/acre. Pinyon and juniper trees occur at low densities. Point quarter data estimate 20 pinyon and 27 juniper trees/acre. Average basal diameter is 7.4 inches for pinyon and 6.8 inches for juniper. Most of these trees are in the 12 to 20 foot tall range.

The herbaceous understory is more abundant in the livestock exclosure compared to outside (18% cover vs 14%). The most common grass is the annual, cheatgrass. It provides 35% of the grass cover with a cover value of 5%. Nested frequency is also higher at 177 compared to 144 outside. Another annual, six weeks fescue, is also abundant and provides an additional 15% of the grass cover. However, perennial grasses are also common with western wheatgrass and mutton bluegrass being the most abundant. These species provide 21% and 15% of the grass cover respectively. Bluebunch wheatgrass and bottlebrush squirreltail are also fairly abundant. Forbs are similarly diverse in the livestock exclosure compared to the total exclosure or outside. Most (68%) of the forb cover comes from bastard toadflax, but silvery lupine is also fairly abundant. Several annuals are found in the livestock exclosure, yet they provide only 18% of the forb cover.

1998 APPARENT TREND ASSESSMENT

Trend for soil appears stable. Vegetation and litter cover are higher in the livestock exclosure compared to the total exclosure or outside. Percent bare ground is similar to the total exclosure at 23% but lower than outside (23% vs 31%). Erosion does not appear to be a problem. Trend for the key browse species, basin big sagebrush, serviceberry, and bitterbrush appear stable with higher densities compared to outside the

exclosure. Serviceberry and bitterbrush display moderate use, good vigor and low decadence. Reproduction appears adequate to maintain the population. Sagebrush density is nearly two times higher in the livestock exclosure compared to outside. Utilization is moderate to heavy, although vigor is good on most plants and percent decadence is relatively low at 34%. There are a large number of dead plants and half of the decadent sagebrush were classified as dying (581 plants/acre). However, reproduction is currently appears adequate to maintain the stand. The herbaceous understory is more abundant in the livestock exclosure compared to outside. Total herbaceous cover is 18%. Annual grasses, cheatgrass and six weeks fescue, are abundant and provide half of the grass cover. Perennial grasses are also fairly abundant however. Forb diversity is similar compared to the total exclosure and outside. In addition, perennial forbs are more abundant in the livestock exclosure compared to outside. The most common species include bastard toadflax, silvery lupine, and wooly plantain.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 5

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Agropyron smithii	59	19	1.37
G	Bromus tectorum (a)	97	30	3.62
G	Oryzopsis hymenoides	12	4	.10
G	Poa fendleriana	25	6	1.57
G	Sitanion hystrix	5	4	.05
G	Sporobolus cryptandrus	1	1	.00
G	Stipa comata	14	5	.07
G	Vulpia octoflora (a)	58	19	.87
Total for Annual Grasses		155	49	4.50
Total for Perennial Grasses		116	39	3.17
Total for Grasses		271	88	7.67
F	Arabis spp.	5	2	.01
F	Astragalus spp.	7	2	.01
F	Comandra pallida	81	30	1.53
F	Descurainia pinnata (a)	7	4	.10
F	Draba spp. (a)	7	3	.01
F	Erigeron spp.	3	1	.00
F	Eriogonum racemosum	5	2	.01
F	Lappula occidentalis (a)	5	3	.04
F	Lupinus argenteus	6	3	.39
F	Microsteris gracilis (a)	11	4	.02
F	Plantago patagonica (a)	38	14	.63
Total for Annual Forbs		68	28	0.80
Total for Perennial Forbs		107	40	1.97
Total for Forbs		175	68	2.77

BROWSE TRENDS --

Herd unit 27R, Study no: 5

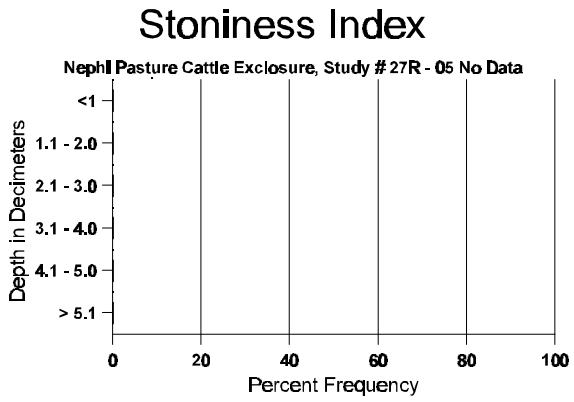
Type	Species	Strip Frequency '98	Average Cover % '98
B	Amelanchier utahensis	14	4.65
B	Artemisia tridentata tridentata	44	2.87
B	Gutierrezia sarothrae	20	1.39
B	Juniperus osteosperma	1	.38
B	Opuntia spp.	1	.03
B	Pinus edulis	-	.15
B	Purshia tridentata	14	3.66
B	Ribes spp.	1	-
Total for Browse		95	13.14

BASIC COVER --
Herd unit 27R, Study no: 5

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	226	28.13
Litter	296	39.22
Cryptogams	20	1.08
Bare Ground	164	12.42

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 05, Study Name: Nephi Pasture Cattle Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
20.5	70.5 (17.7)	5.8	90.2	2.0	7.8	.8	6.9	12.8	.2



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 5

Type	Quadrat Frequency '98
Rabbit	18
Elk	1
Deer	21

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 5

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	98	1	-	-	4	-	-	-	-	-	5	-	-	-	100			5
Y	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60			3
M	98	11	5	-	-	-	-	-	3	-	19	-	-	-	380	47	52	19
D	98	2	1	-	-	-	-	-	-	-	1	-	1	1	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98		Moderate Use 24%			Heavy Use 00%			Poor Vigor 08%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		500	Dec:		12%
Artemisia tridentata tridentata																		
S	98	2	-	-	4	-	-	-	-	-	6	-	-	-	120			6
Y	98	10	4	-	2	-	-	-	-	-	16	-	-	-	320			16
M	98	15	10	9	2	1	1	-	-	-	38	-	-	-	760	27	29	38
D	98	6	6	5	-	4	4	-	-	-	15	-	-	10	500			25
X	98	-	-	-	-	-	-	-	-	-	1	-	-	-	860			43
% Plants Showing '98		Moderate Use 32%			Heavy Use 24%			Poor Vigor 13%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1580	Dec:		32%
Gutierrezia sarothrae																		
S	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	98	1	-	-	1	-	-	-	-	-	2	-	-	-	40			2
M	98	42	-	-	-	-	-	-	-	-	42	-	-	-	840	11	12	42
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		880	Dec:		-
Juniperus osteosperma																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	4	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Purshia tridentata																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	4	1	-	1	-	-	-	-	-	6	-	-	-	120			6
M	98	6	6	-	3	4	-	-	-	-	19	-	-	-	380	31	48	19
D	98	-	-	-	2	-	-	-	-	-	1	-	-	1	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 41%			Heavy Use 00%				Poor Vigor 04%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		540	Dec:		7%
Ribes spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-

Trend Study 27-7-98

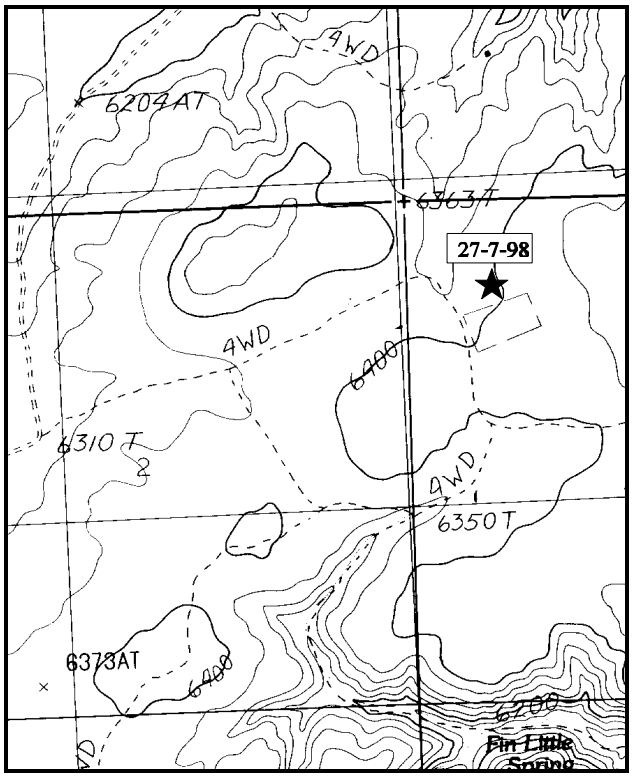
Study site name: Nephi Pasture Outside . Range type: Mixed Brush .

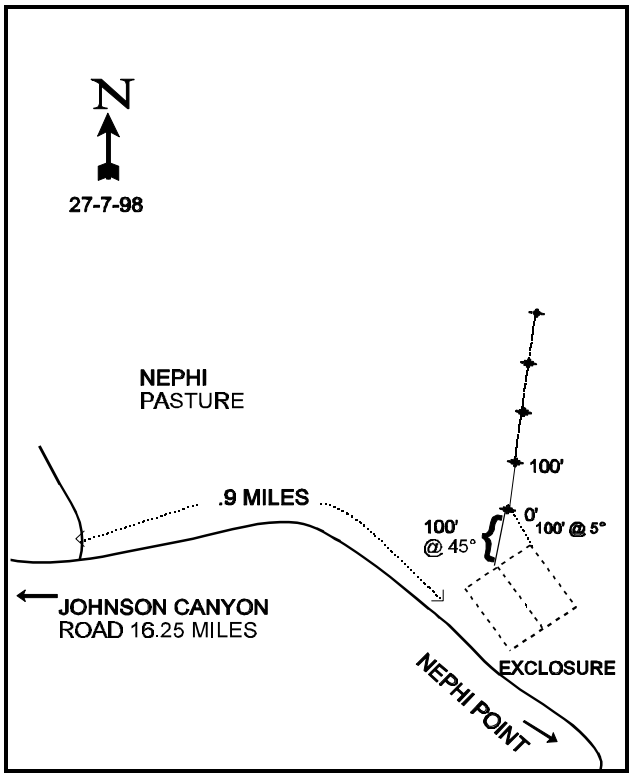
Compass bearing: frequency baseline 4 degrees.

Footmark (first frame at) 5 feet, footmarks (frequency belts) line 1 (11 & 71ft), line 2 (34ft), line 3 (59ft), line 4 (95ft).

LOCATION DESCRIPTION

From Kanab, take US 9 east for 9.4 miles to Johnson Canyon. Travel north up Johnson Canyon 9.75 miles to the Lock Ridge-Nephi Pasture road. Turn right. Go 16.25 miles (see 52-6-87 for more detail) on the main road to a major intersection in Nephi Pasture. Continue straight towards Nephi Point, going 0.9 miles to an exclosure. Walk east along the fence on the north side of the exclosure to the inner fence. From the northeast corner of the tallest fence, walk 100 feet NE to the 1st baseline stake, a cut fencepost tagged #7808. The study runs up the hill bearing 20°.





Map Name: Nephi Point Diagrammatic Sketch

Township 42S , Range 4W , Section 1 UTM 4116620.717 N, 394255.781 E

DISCUSSION

Trend Study No. 27-7 (52-7)

The Nephi Pasture Exclosure study samples the outside of the exclosure which is a basin big sagebrush type with a significant bitterbrush component. It was sampled in 1998 along with the adjacent exclosure treatments (livestock and total exclosure). It has a slope of 5% to 10% with a southwest aspect. Elevation is about 6,400 feet. The area is within the Vermillion-Nephi Pasture allotment, which allows 190 cattle during the winter. Pellet group data from 1998 estimate 64 deer, 16 cow, and only 1 elk days use/acre. Cow sign appeared old and most of the deer pellet groups were from last fall and winter. Deer use this area during mild winters, but utilize areas south of US-89 during severe winters.

The area was identified by the BLM as an Upland Sand site (11-13 inches precipitation) and a mountain big sagebrush/Indian ricegrass habitat type. On this study, the sagebrush was identified during the readings as basin big sagebrush, not mountain big sagebrush, because of it's size and growth form, in addition to the depth of the soils on the site. Typical of all of the Nephi Pasture area, the soil is composed largely of fine sand, formed by aeolian derived sandstone parent materials. It has a loamy sand texture with a moderately acid pH (5.9). The soil is deep with an effective rooting depth (see methods) estimated at nearly 21 inches. There are no rock fragments apparent in the profile or on the surface. Soil temperature is fairly high at 60°F at an average depth of 18 inches. Soil temperature is about 10°F higher in the exclosure. Organic matter is limited at only 0.7%. Potassium may be limiting to plant growth at just 38.4 ppm. Values below 70 ppm are thought limiting to normal plant development. There is evidence of wind and surface water erosion, but erosion does not appear to be serious.

Serviceberry, basin big sagebrush, and antelope bitterbrush dominate the shrub component. These key species combined to produce 71% of the vegetative cover on the site in 1997 and 51% in 1998. Mature serviceberry plants are very large, averaging 5½ to 6 feet in height. Available parts of these shrubs have been moderately to heavily hedged during all readings, with the heaviest use reported in 1987 (100% heavy use). The increased density reported in 1992 (265 to 980 plants/acre) appears to have been caused by observer differences in counting the rhizomatous shrub. Clumps of several stems in the same area were considered one plant in 1997 and 1998. Vigor is good on most plants and percent decadency is low at only 11% in 1998. Reproduction has been poor since 1997, but adequate to maintain the stand.

The basin big sagebrush population has remained relatively stable at around 1,800 plants/acre since 1987. The population peaked in 1992 at 2,720 plants/acre, primarily due to the high number of young and decadent plants sampled. Mature plants are tall, averaging 3 to 4 feet in height with some up to 6 feet tall. Sagebrush has exhibited generally light to moderate use with heavy use on some individuals. The population appears to be in a state of decline, although density estimated don't yet show this. Percent decadence has increased from 7% in 1987 to 46% in 1997 and 1998. The number of plants classified as dying has been high since 1992 and reproduction has been poor since 1997. There is currently more decadent/dying plants than young plants to replace them. In addition, dead plants are abundant representing 42% of the population in 1997 increasing slightly to 43% by 1998.

Bitterbrush has a relatively stable density which has ranged from 1,700 plants/acre in 1992 to 1,220 by 1998. This preferred shrub is sought out by grazing animals with all observed plants being heavily hedged in 1987. Heavy use has since declined to 80% in 1992, 55% in 1997, and 75% by 1998. Many plants are partly unavailable for use due to the extensive hedging over the years. However, vigor is generally good and percent decadence low. Recruitment has declined since 1987 and 1992, but it is adequate to maintain the stand. Broom snakeweed occurs in scattered patches and appears to have a stable, mostly mature population.

The herbaceous understory is rather sparse. Perennial grass cover has provided only about 2% cover since 1992. Cheatgrass, found in only 1 quadrat in 1992, has steadily and significantly increased in nested

frequency. Currently it provides 45% of the meager grass cover. Six weeks fescue, another annual species, has also increased significantly since 1992. The most abundant perennial grasses include western wheatgrass and bottlebrush squirreltail. There has been light grazing of the palatable grasses, mainly sand dropseed and western wheatgrass. Forb cover is also low at only 2% in 1992, 3% in 1997, and 7% by 1998. The increase in 1998 forb cover comes entirely from a significant increase in wooly plantain, an annual which currently ('98) provides 74% of the forb cover. Perennial forbs are rare with the most common species being bastard toadflax.

1992 TREND ASSESSMENT

Percent bare ground is now estimated at 27%, down from 39% in 1987. Percent litter cover is similar to 1987 estimates. Trend for soil is considered slightly up, but still in poor condition. Because the sample size is much larger now, many of the estimates for browse density have increased from the 1987 survey. Therefore, percent decadence, form class, and vigor should be the parameters most important for trend evaluation. The key species for the site in order of dominance (percent of total plant cover) are: serviceberry (33%), basin big sagebrush (32%) and bitterbrush (18%). The basin big sagebrush is the browse with the highest percent decadence, but is not higher than expected with the site potential and condition, along with the length of the current drought. The key species also all have some evidence of reproduction and a good percent young age class of plants. The trend for browse would be considered stable. For the herbaceous understory, annuals in the past were ignored in the surveys. Now, if we "ignore" the annuals and look at the trend for only perennial species, the sum of nested frequencies would indicate a stable trend.

TREND ASSESSMENT
soil - up slightly
browse - stable
herbaceous understory - stable but depleted

1997 TREND ASSESSMENT

Trend for soil is considered stable even with an increase in percent bare ground. Nested frequency of vegetation and litter increased as did the sum of nested frequency for grasses and forbs. There is some evidence of soil pedestaling, but much of this appears to be caused by livestock trails around shrubs. Erosion is not currently a problem on the site. Trend for the key browse species is mixed. Bitterbrush and serviceberry appear to be stable with moderate to heavy use, good vigor, and low decadence. The increase in density between 1992 and 1997 appear to be observer differences due to the lack of dead plants. This rhizomatous shrub can be difficult to count when in dense clusters. Several stems coming from the same general area were considered one plant in 1997. Basin big sagebrush appears to have a declining trend with a reduced population density, moderate to heavy use, reduced vigor, and increasing decadence. In addition, the large number of dead plants counted in 1997 indicate a definite die off. A decline in density can also be seen in all age classes. Since sagebrush accounts for one third of the shrub cover, the browse trend is considered slightly down. The herbaceous trend is stable but still depleted. Sum of nested frequency for grasses increased, although this was due to a significant increase in the nested frequencies of cheatgrass and sixweeks fescue. The most common native grass, bottlebrush squirreltail, increased slightly. Sum of nested frequency for forbs also increased slightly, due mainly to a significant increase in the nested frequency of toadflax.

TREND ASSESSMENT
soil - stable
browse - down for sagebrush, slightly down overall
herbaceous understory - stable

1998 TREND ASSESSMENT

Trend for soil appears up slightly due to a decline in percent bare ground from 36% to 31%, combined with an increase in vegetation and cryptogamic cover. Conditions are still poor however. Trend for the key browse species are similar to 1997 estimates. Utah serviceberry and antelope bitterbrush trends appear stable. Bitterbrush does show extremely heavy use, but vigor is good, reproduction adequate, and percent decadence low at only 13%. The sagebrush population has remained at a similar density since 1987, but the population has become increasingly decadent, (now at 46%) and 43% of the sagebrush are dead (1,440 plants/acre). This combined with poor reproduction in 1997 and 1998 point to a decline. This decline does not appear to be caused by utilization because the livestock exclosure and total exclosure also show similar trends. Overall browse trend is considered stable since conditions for sagebrush are similar to 1997. However, the sagebrush population should be watched closely. Trend for the herbaceous understory is stable, although poor condition. Sum of nested frequency for perennial grasses and forbs are similar to 1997 estimates. One negative factor is the significant increase in nest frequency for the annuals; cheatgrass, six weeks fescue, and wooly plantain.

HERBACEOUS TRENDS --
Herd unit 27 , Study no: 7

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %		
		'87	'92	'97	'98	'87	'92	'97	'98	'92	'97	'98
G	Agropyron smithii	ab24	a4	bc48	c71	12	2	21	30	.03	.29	.50
G	Bromus tectorum (a)	-	a3	b112	c144	-	1	37	51	.00	2.35	3.21
G	Oryzopsis hymenoides	11	25	21	14	4	10	9	6	.34	.10	.25
G	Poa fendleriana	8	-	-	-	3	-	-	-	-	-	-
G	Poa secunda	a-	b12	b16	b15	-	5	6	5	.10	.39	.10
G	Sitanion hystrix	54	58	62	39	24	25	25	17	.51	.83	.62
G	Sporobolus cryptandrus	24	33	14	31	13	16	7	17	.63	.06	.33
G	Stipa comata	22	24	25	21	10	12	12	10	.32	.14	.16
G	Vulpia octoflora (a)	-	a27	b73	c144	-	-	31	-	-	.33	-
Total for Annual Grasses		0	30	185	288	0	13	68	103	0.11	2.69	5.13
Total for Perennial Grasses		143	156	186	191	66	70	80	85	1.94	1.82	1.97
Total for Grasses		143	186	371	479	66	83	148	188	2.06	4.51	7.10
F	Arabis spp.	-	-	5	3	-	-	3	2	-	.04	.01
F	Astragalus spp.	8	2	1	1	4	1	1	1	.00	.00	.00
F	Calochortus nuttallii	-	-	1	-	-	-	1	-	-	.01	-
F	Chaenactis douglasii	a-	ab2	ab1	b10	-	2	1	4	.01	.00	.19
F	Collomia linearis (a)	-	-	3	-	-	-	1	-	-	.00	-
F	Comandra pallida	ab72	a58	b117	b98	35	29	48	54	.50	1.79	1.04
F	Collinsia parviflora (a)	-	-	1	-	-	-	1	-	-	.15	-
F	Cruciferae	a-	b16	a-	a-	-	7	-	-	.03	-	-
F	Delphinium bicolor	-	-	3	-	-	-	1	-	-	.00	-
F	Descurainia spp. (a)	-	16	30	26	-	8	14	10	.40	.12	.13
F	Draba spp. (a)	-	-	-	8	-	-	-	4	-	-	.04

Type	Species	Nested Frequency				Quadrat Frequency				Average Cover %		
		'87	'92	'97	'98	'87	'92	'97	'98	'92	'97	'98
F	Eriogonum cernuum (a)	-	$_{b}$33	$_{a}$10	$_{a}$1	-	17	5	1	.24	.05	.00
F	Erigeron spp.	-	-	1	3	-	-	1	1	-	.00	.00
F	Eriogonum racemosum	1	-	7	4	1	-	3	2	-	.04	.01
F	Euphorbia glyptosperma (a)	17	8	-	-	8	4	-	-	.04	-	-
F	Frasera speciosa	-	-	2	-	-	-	1	-	-	.00	-
F	Gilia spp. (a)	-	$_{a}$-	$_{b}$24	$_{a}$-	-	-	10	-	-	.12	-
F	Lappula occidentalis (a)	-	$_{a}$-	$_{b}$4	$_{a}$-	-	-	4	-	-	.04	-
F	Lupinus spp.	-	-	1	-	-	-	1	-	.03	.03	-
F	Microsteris gracilis (a)	-	21	31	-	-	9	11	-	.04	.15	-
F	Oenothera pallida	-	-	-	3	-	-	-	1	-	-	.03
F	Oenothera pallida	-	3	-	-	-	1	-	-	.03	-	-
F	Penstemon spp.	$_{a}$-	$_{b}$10	$_{a}$-	$_{ab}$8	-	5	-	3	.22	-	.04
F	Phlox austromontana	$_{a}$-	$_{bc}$14	$_{c}$22	$_{ab}$6	-	7	11	2	.30	.20	.30
F	Phlox hoodii	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$8	-	-	-	6	-	-	.05
F	Plantago patagonica (a)	-	$_{b}$88	$_{a}$46	$_{c}$195	-	36	22	62	.40	.18	5.36
F	Polygonum douglasii (a)	-	15	26	-	-	6	9	-	.03	.04	-
F	Senecio multilobatus	4	-	1	-	2	-	1	-	-	.00	-
F	Sphaeralcea parvifolia	$_{b}$12	$_{ab}$3	$_{a}$1	$_{a}$1	7	2	1	1	.01	.00	.00
F	Unknown forb-annual (a)	-	3	-	-	-	2	-	-	.01	-	-
Total for Annual Forbs		17	184	175	230	8	82	77	77	1.18	0.88	5.54
Total for Perennial Forbs		97	108	163	145	49	54	74	77	1.14	2.15	1.69
Total for Forbs		114	292	338	375	57	136	151	154	2.32	3.04	7.24

Values with different subscript letters are significantly different at % = 0.10 (annuals not read in 87)

BROWSE TRENDS --
Herd unit 27 , Study no: 7

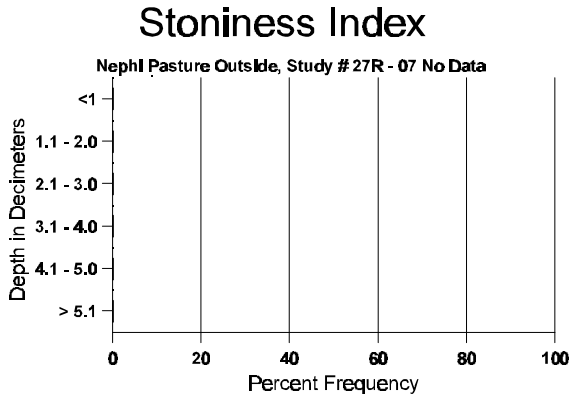
Type	Species	Quadrat Frequency '92	'97	'98	Average Cover % '92	'97	'98
B	Amelanchier utahensis	23	13	13	12.05	8.44	3.32
B	Artemisia filifolia	0	0	3	-	-	.18
B	Artemisia tridentata tridentata	58	58	55	11.92	5.20	3.20
B	Chrysothamnus viscidiflorus	0	1	1	-	.00	-
B	Eriogonum microthecum	0	0	1	-	-	-
B	Gutierrezia sarothrae	34	32	27	1.53	.26	.68
B	Leptodactylon pungens	3	5	0	.06	.06	-
B	Opuntia spp.	1	0	0	-	-	-
B	Purshia tridentata	36	34	37	6.50	6.59	7.64
B	Ribes spp.	0	0	0	-	-	-
Total for Browse		155	143	137	32.08	20.58	15.03

BASIC COVER --
Herd unit 27 , Study no: 7

Cover Type	Nested Frequency '92	'97	'98	Average Cover % '87	'92	'97	'98
Vegetation	71	300	334	.75	34.50	27.35	34.91
Rock	-	13	-	0	.04	.05	0
Pavement	-	9	20	0	0	.02	.04
Litter	236	388	395	59.75	54.40	47.79	48.41
Cryptogams	21	78	150	1.00	2.00	1.93	8.56
Bare Ground	187	282	276	38.50	26.89	35.68	30.71

SOIL ANALYSIS DATA --
Herd Unit 27, Study # 07, Study Name: Nephi Pasture Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
20.8	60.0 (16.9)	5.9	87.0	7.4	5.6	.7	11.9	38.4	.2



PELLET GROUP FREQUENCY --
Herd unit 27 , Study no: 7

Type	Quadrat Frequency '92	'97	'98
Rabbit	49	20	25
Deer	26	32	27
Cattle	3	5	5

BROWSE CHARACTERISTICS --
Herd unit 27 , Study no: 7

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier utahensis																		
S	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	6	-	-	6	-	-	-	120			6
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
Y	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	92	3	-	1	-	4	1	13	-	-	22	-	-	-	440			22
	97	-	-	-	5	-	-	-	-	-	5	-	-	-	100			5
	98	4	-	1	1	-	-	-	-	-	6	-	-	-	120			6
M	87	-	-	2	-	-	-	-	-	-	2	-	-	-	133	60	56	2
	92	-	-	4	-	5	1	10	2	-	22	-	-	-	440	-	-	22
	97	-	1	3	-	5	-	-	1	-	9	1	-	-	200	83	86	10
	98	3	4	-	1	1	2	-	-	-	11	-	-	-	220	66	73	11
D	87	-	-	1	-	-	-	-	-	-	-	-	-	1	66			1
	92	-	-	2	-	-	-	3	-	-	-	-	2	3	100			5
	97	-	-	-	-	2	-	-	-	-	-	-	-	2	40			2
	98	-	-	-	-	-	1	-	1	-	2	-	-	-	40			2
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	25%	+73%
'92	18%	18%	10%	-65%
'97	47%	18%	12%	+11%
'98	26%	21%	00%	

Total Plants/Acre (excluding Dead & Seedlings)			Dec:	
	'87	265		25%
	'92	980		10%
	'97	340		12%
	'98	380		11%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	3	-	-	-	-	-	3	-	-	-	60			3
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120	9	15	6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'92	00%	00%	00%
'97	00%	00%	00%
'98	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)			
	'87	0	Dec: -
	'92	0	-
	'97	0	-
	'98	260	-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata tridentata																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	9	-	-	-	-	-	1	-	-	10	-	-	-	200			10
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
Y	87	5	2	-	-	-	-	-	-	-	7	-	-	-	466			7
	92	24	2	-	7	-	-	7	-	-	37	3	-	-	800			40
	97	16	-	-	-	-	-	-	-	-	16	-	-	-	320			16
	98	4	8	-	-	-	-	-	-	-	11	-	1	-	240			12
M	87	2	11	6	-	-	-	-	-	-	19	-	-	-	1266	34	35	19
	92	36	10	2	3	-	-	-	-	-	49	2	-	-	1020	-	-	51
	97	6	15	7	1	-	1	-	-	-	28	-	2	-	600	36	45	30
	98	14	17	3	3	-	2	-	-	-	39	-	-	-	780	31	37	39
D	87	-	2	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	33	6	-	2	2	-	2	-	-	12	-	3	30	900			45
	97	8	29	1	-	1	-	-	-	-	2	-	2	35	780			39
	98	26	9	2	1	4	1	-	-	-	22	-	-	21	860			43
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	2	-	-	-	-	-	-	-	-	-	-	-	-	1200			60
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	1440			72

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	54%	21%	00%	+31%
'92	15%	01%	24%	-38%
'97	53%	11%	46%	+10%
'98	40%	09%	23%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	1865	Dec:		7%
'92	2720			33%
'97	1700			46%
'98	1880			46%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	2	-	-	-	-	-	-	-	-	1	-	1	-	133			2
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20	7	7	1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	18	13	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	50%	
'92	00%	00%	00%	
'97	00%	00%	00%	+ 0%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	133	Dec:	-
	'92	0		-
	'97	20		-
	'98	20		-

Eriogonum microthecum																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	-	-	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	
'97	00%	00%	00%	
'98	00%	100%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	0		-
	'97	0		-
	'98	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	10	-	-	-	-	-	-	-	-	9	-	-	1	200			10
	97	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
	97	8	-	-	1	-	-	-	-	-	9	-	-	-	180			9
	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	87	58	-	-	-	-	-	-	-	-	58	-	-	-	3866	9	12	58
	92	48	-	-	3	-	-	1	-	-	52	-	-	-	1040	-	-	52
	97	49	-	-	4	-	-	-	-	-	53	-	-	-	1060	11	12	53
	98	62	-	-	-	-	-	-	-	-	62	-	-	-	1240	11	13	62
D	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	97	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	1	-	-	-	-	-	-	-	-	-	-	-	-	60			3
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-70%
'92	00%	00%	00%	+ 8%
'97	00%	00%	00%	+ 0%
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	3932	Dec:	2%
	'92	1180		2%
	'97	1280		3%
	'98	1280		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Leptodactylon pungens																		
S	87	8	-	-	-	-	-	-	-	-	8	-	-	-	533			8
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	92	-	-	-	-	-	-	1	-	-	1	-	-	-	20			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	6	-	-	-	-	-	-	-	-	6	-	-	-	400	5	6	6
	92	16	-	-	-	-	-	-	-	-	16	-	-	-	320	-	-	16
	97	9	-	-	5	-	-	-	-	-	13	-	1	-	280	18	20	14
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
D	87	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-43%
'92	00%	00%	00%	-18%
'97	00%	00%	07%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	599	Dec:	11%	
'92	340		0%	
'97	280		0%	
'98	0		0%	

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
Y	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	13	0
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	1	-	-	-	-	-	-	-	-	-	-	1	-	20			1
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'87	00%	00%	00%
'92	00%	00%	50%
'97	00%	00%	00%
'98	00%	00%	00%

%Change		
Total Plants/Acre (excluding Dead & Seedlings)	'87	0
	'92	40
	'97	0
	'98	0
Dec:		0%
		50%
		0%
		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	1	-	1	-	-	-	2	-	-	-	40			2
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	-	-	6	-	-	-	-	-	-	6	-	-	-	400			6
	92	2	5	6	1	3	3	1	-	-	21	-	-	-	420			21
	97	-	3	1	-	-	-	-	-	-	4	-	-	-	80			4
	98	1	2	-	-	1	2	-	-	-	6	-	-	-	120			6
M	87	-	-	15	-	-	-	-	-	-	15	-	-	-	1000	12	41	15
	92	-	3	19	2	-	7	-	-	11	39	-	-	3	840	-	-	42
	97	3	17	20	1	1	9	2	-	-	51	-	2	-	1060	21	43	53
	98	3	6	19	-	2	16	-	-	1	47	-	-	-	940	20	43	47
D	87	-	-	1	-	-	-	-	-	-	1	-	-	-	66			1
	92	-	-	6	-	-	-	-	-	16	11	-	-	11	440			22
	97	-	1	1	-	-	3	-	-	-	2	-	-	3	100			5
	98	-	-	3	-	-	5	-	-	-	7	-	-	1	160			8
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	100%	00%	+14%
'92	13%	80%	16%	-27%
'97	35%	55%	08%	- 2%
'98	18%	75%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	1466	Dec:	5%
	'92	1700		26%
	'97	1240		8%
	'98	1220		13%

Ribes spp.																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	92	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	97	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	30	25	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'92	00%	00%	00%	
'97	00%	00%	00%	
'98	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'92	0		-
	'97	0		-
	'98	0		-

NEPHI PASTURE EXCLOSURE COMPARISON SUMMARY

Total Exclosure 27R-4, Livestock Exclosure 27R-5, and Outside 27-7

1998 Comparisons

Ground cover characteristics differ slightly between grazing effects. Bare ground is more abundant outside of the exclosure, and similar between the livestock and total exclosure. Vegetation cover is highest in the livestock exclosure and lowest outside. Litter cover is highest in the livestock exclosure and lowest in the total exclosure. Soil characteristics are similar between treatments. Soils are deep with sandy loam to sand textures, a moderately acid pH, low organic matter content, deficient values for phosphorus and potassium, and high average soil temperatures. There is not much erosion occurring on any site due to the lack of slope, combined with the high permeability of the soil. Soil outside of the exclosure has a higher phosphorous level and a lower average soil temperature by 10°F.

All sites support good stands of basin big sagebrush, bitterbrush, and serviceberry, with sagebrush being the most prevalent. However, the sagebrush stand in the total exclosure is the least healthy followed closely by outside. Percent decadence is high at 64% in the total exclosure compared to 34% in the livestock exclosure and 46% outside. Vigor is poor on 46% of the total exclosure population, compared to 18% in the livestock, and 23% outside. Utilization is moderate to heavy outside and within the livestock exclosure. However, deer days use/acre is significantly higher within the livestock exclosure (111 ddu/acre vs 64 ddu/acre) where the sagebrush is in the best condition. Livestock use was estimated at 16 days use/acre outside. There was also some light to moderate use of the sagebrush within the total exclosure due to a poorly maintained fence. Weighing these factors, it appears that the sagebrush population is in a state of decline in the total exclosure and outside of the exclosure, with the livestock exclosure maintaining a stable trend. It should be noted that sagebrush are more susceptible to winter injury than any other shrub species occurring on the site. This injury is caused when the shrub is under extended periods of drought stress, which is intensified by the high percentage of sand in the soil and the depth of the soil. When they are under this kind of stress, and in conjunction with mild winters, they would break dormancy and begin growth very early in the year. Doing so, any substantial length of time with very cold night time temperatures will cause desiccation and death within the shrub crowns for there is no available moisture within the deep sandy soil to carry out photosynthesis. This effect would be aggravated by moderate duel use on the outside of the exclosure, causing even higher death rates and higher rates of decadency.

Trends for bitterbrush and serviceberry appear stable for all sites due to adequate reproduction, good vigor, and low decadence. Nevertheless, utilization of bitterbrush has been extremely heavy outside of the exclosure since 1987, while only moderate use is seen within the livestock exclosure. Since more deer days use/acre were found within the livestock exclosure than outside, a significant portion of the bitterbrush use outside of the exclosure appears to be coming from livestock.

The herbaceous understories are similar with respect to species composition. The annual, cheatgrass, is the most abundant grass on all three treatments and perennial species are generally lacking. Another annual, six weeks fescue, is also abundant on all sites. However, percent cover of cheat grass is highest inside of the total exclosure (7.4%) where it accounts for 61% of the grass cover. Next highest is the livestock exclosure where cheat grass has a cover value of 4.7% that represents 35% of the grass cover. The outside site has the lowest cover value for cheatgrass at 3.2%, but due to the lack of perennial grasses, it accounts for 45% of the grass cover. Perennial grasses are most abundant in the livestock exclosure (7% cover), followed by the total exclosure (3.4%), and then outside (2%). The most abundant grasses outside of the exclosure are western wheatgrass and bottlebrush squirreltail. In the livestock exclosure, western wheatgrass and mutton bluegrass are most abundant with bluebunch wheatgrass, Indian ricegrass, and bottlebrush squirreltail also being fairly common. In the total exclosure, the most common perennial grass is needle-and-thread which is rare on the other two treatments. Western wheatgrass and Sandberg bluegrass are also fairly common.

Forbs are depleted but composition is similar between sites. The most common species in the total and livestock exclosure is bastard toad flax. Wooly plantain is also fairly abundant. Outside of the exclosure, wooly plantain is the most abundant forb with smaller amounts of bastard toad flax. All other species occur rarely.

Trend Study 27R-8-98

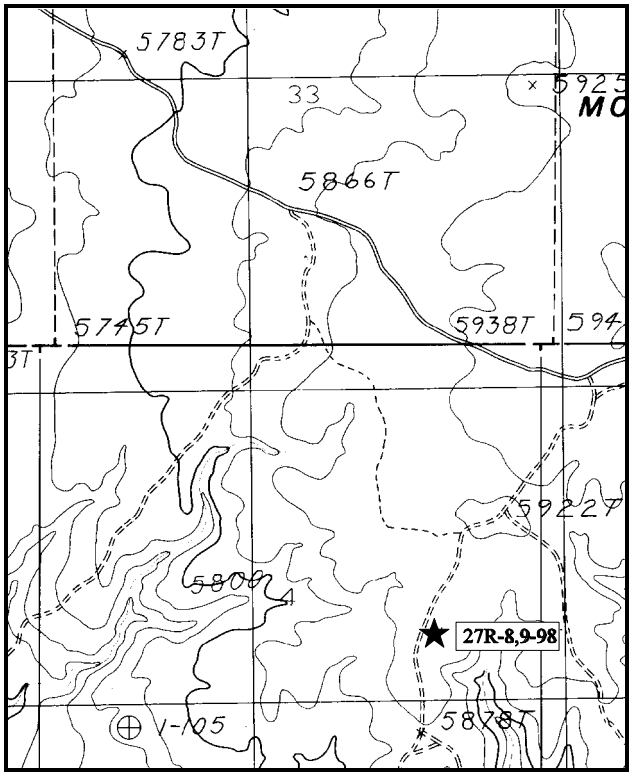
Study site name: Five Mile Mountain Outside . Range type: Burned Sagebrush/Annual Weed

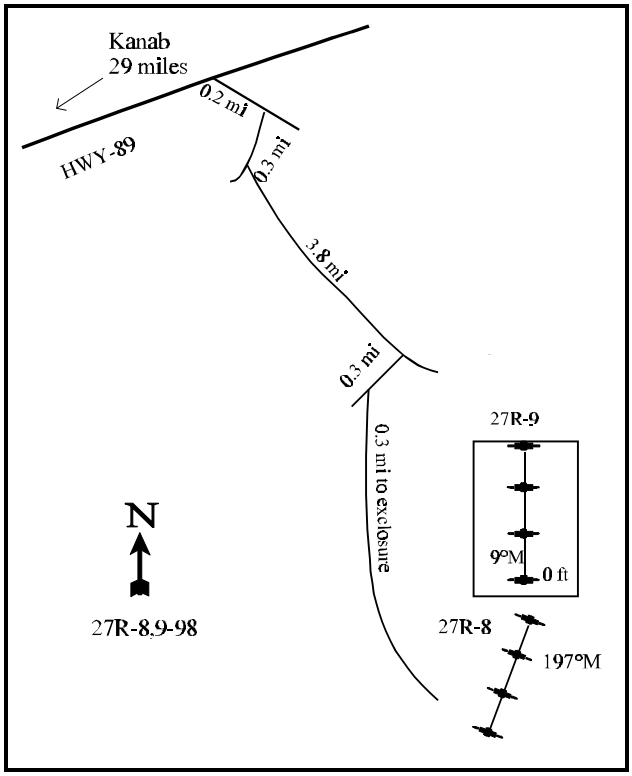
Compass bearing: frequency baseline 197°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95ft), line 2 (59ft), line 3 (34ft & 71 ft).

LOCATION DESCRIPTION

From the 90° turn on HWY-89 in Kanab, travel 29 miles on south-89 (traveling east from Kanab) to the Five-mile Mountain turnoff. Turn right and go approximately 0.2 miles to a fork. Stay right at the fork and continue 0.3 miles to another fork. Go left for 3.8 miles to another fork. At the fork, go right for 0.3 miles to the next fork. From here, go right for 0.3 miles to the exclosure on the left. The 0 foot stake of the baseline is located on the south side of the exclosure and can be located by counting down 5 red posts from the SW corner of the exclosure. Browse tag #473 is attached to the 0 foot stake.





Map Name: Pine Hollow Canyon Diagrammatic Sketch

Township 43S , Range 2W , Section 4 UTM 4106245.732 N, 409584.807 E

DISCUSSION

Trend Study No. 27R-8

This is a new trend study located adjacent to the Five Mile Mountain Exclosure. It is a two-way exclosure (livestock exclosure and outside) with this study sampling the outside portion. A data summary for the livestock exclosure is found in the next study discussion (no. 27R-9). The area is almost level with a south, southeast aspect and an elevation of about 5,900 feet. It supports a black sagebrush-grass range type with scattered juniper trees. A fire has burned some of the area 3 to 4 years ago and eliminated most of the sagebrush in the burned areas. The site is located on the south slope of Five Mile Mountain, a low plateau south of Highway 89. It gets most big game use in severe winters when deer drop down off the Vermillion Cliffs. Pellet group data from outside of the exclosure estimate 20 deer and 12 cow days use/acre.

Soil at the site is shallow and rocky with a hard pan encountered at almost 9 inches in depth. Texture is a loam with a neutral pH (7.2). Both phosphorus and potassium appear to be limiting to plant development at just 8.2 ppm and 57.6 ppm respectively. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. Rock and especially pavement are abundant on the soil surface. The profile is also quite rocky. Due to the rock content, average soil temperature is extremely high at 91°F at an average depth of just over 9 inches. This condition causes rapid soil drying and creates a harsh environment for sagebrush seedlings to become establish. It also gives winter annuals like cheatgrass and storksbill a competitive advantage against cool season perennial grasses and forbs.

The fire was spotty outside of the exclosure, leaving several areas unburned. Burned areas are dominated by broom snakeweed, while unburned spots support moderately dense stands of black sagebrush. The sagebrush has an estimated density of 2,180 plants/acre. Nearly half of the sagebrush exhibit some characteristics of Wyoming big sagebrush indicating possible hybridization between these two species. The population is heavily utilized, however vigor is normal on most plants and percent decadence is relatively low at 19%. Reproduction is poor with few seedlings encountered and young plants accounting for only 6% of the population. Recruitment is currently barely enough to maintain the stand, and unless it improves, the population will likely decline in the future.

Broom snakeweed is currently the most abundant shrub on the site with an estimated density of 2,360 mostly mature plants/acre. It appears that the population has declined considerably over the past few years due to the high number of dead snakeweed shrubs counted (4,280 plants/acre). Reproduction is also poor and a further decline in density is likely in the future.

The herbaceous understory is extremely poor in composition and abundance. Cheatgrass brome, an annual, totally dominates the site by providing 95% of the grass cover. Equally abundant is the annual forb storksbill which accounts for 95% of the forb cover. These two species alone provide 68% of the total vegetation cover on the site. Perennial grasses and forbs are rare in their occurrence with all species combined producing less than ½ of 1% cover.

1998 APPARENT TREND ASSESSMENT

Soil conditions are poor. Litter cover is limited, rock and pavement cover are high (38%), leaving 25% of the ground surface as bare ground. Erosion is not a problem however due to the levelness of the terrain. Trend for the key browse species, black sagebrush, is tenuous. The population is mostly mature with poor reproduction and heavy use. Unless recruitment improves, the population will decline. The increaser/invader, broom snakeweed, appears to be in the same situation. Most of the stand is mature, reproduction is poor, and an extremely large number of dead plants were sampled. The herbaceous understory is extremely poor with annuals totally dominating the herbaceous components. Perennial grasses and forbs are rare.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 8

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	424	99	8.36
G	Oryzopsis hymenoides	3	1	.03
G	Poa fendleriana	6	2	.01
G	Poa secunda	7	2	.06
G	Sitanion hystrix	3	1	.03
G	Vulpia octoflora (a)	39	15	.32
Total for Annual Grasses		463	114	8.68
Total for Perennial Grasses		19	6	0.13
Total for Grasses		482	120	8.81
F	Draba spp. (a)	102	38	.36
F	Erodium cicutarium (a)	264	67	8.71
F	Lappula occidentalis (a)	3	1	.00
F	Phlox longifolia	12	4	.02
F	Plantago patagonica (a)	1	1	.00
F	Salsola iberica (a)	1	1	.00
F	Sphaeralcea parvifolia	18	8	.04
F	Unknown forb-perennial	5	2	.01
Total for Annual Forbs		371	108	9.09
Total for Perennial Forbs		35	14	0.07
Total for Forbs		406	122	9.17

BROWSE TRENDS --
Herd unit 27R, Study no: 8

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	39	4.56
B	Cercocarpus ledifolius	0	-
B	Chrysothamnus viscidiflorus viscidiflorus	1	-
B	Gutierrezia sarothrae	44	1.92
B	Juniperus osteosperma	1	.71
B	Opuntia spp.	1	.03
B	Ribes spp.	1	-
B	Yucca baccata baccata	0	-
Total for Browse		96	7.22

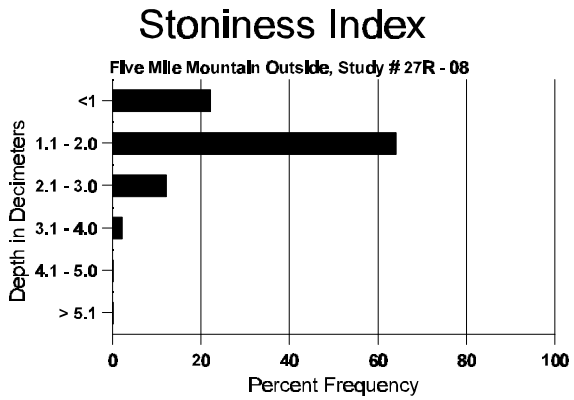
BASIC COVER --

Herd unit 27R, Study no: 8

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	447	30.02
Rock	306	12.34
Pavement	454	25.57
Litter	481	32.43
Cryptogams	48	.87
Bare Ground	406	25.17

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 08, Study Name: Five Mile Mountain Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
8.5	91.0 (9.4)	7.3	50.7	28.7	20.6	1.7	8.23	57.6	.5



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 8

Type	Quadrat Frequency '98
Rabbit	29
Deer	24
Cattle	5

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 8

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
S	98	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	3	-	-	-	-	3	-	-	-	6	-	-	-	120			6
M	98	10	12	28	-	-	32	-	-	-	82	-	-	-	1640	11	20	82
D	98	3	16	-	-	-	2	-	-	-	14	-	-	7	420			21
X	98	-	-	-	-	-	-	-	-	-	1	-	-	-	560			28
% Plants Showing '98				Moderate Use 26%			Heavy Use 60%				Poor Vigor 06%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2180	Dec:		19%
Cercocarpus ledifolius																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	14	29	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Chrysothamnus viscidiflorus viscidiflorus																		
D	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 100%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		100%
Gutierrezia sarothrae																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	91	-	-	-	-	-	-	-	-	91	-	-	-	1820	7	9	91
D	98	27	-	-	-	-	-	-	-	-	16	-	-	11	540			27
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	4280			214
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 09%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2360	Dec:		23%
Juniperus osteosperma																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	6	8	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Ribes spp.																		

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	-	-	2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%			Poor Vigor 00%									%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Yucca baccata baccata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	20	0
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%			Poor Vigor 00%									%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

Trend Study 27R-9-98

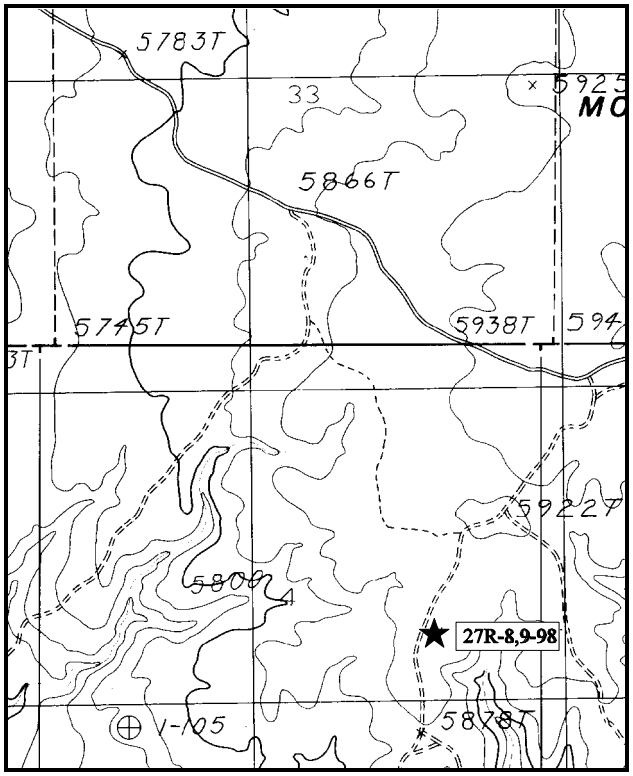
Study site name: Five Mile Mountain Exclosure . Range type: Burned Sagebrush/Annual Weed

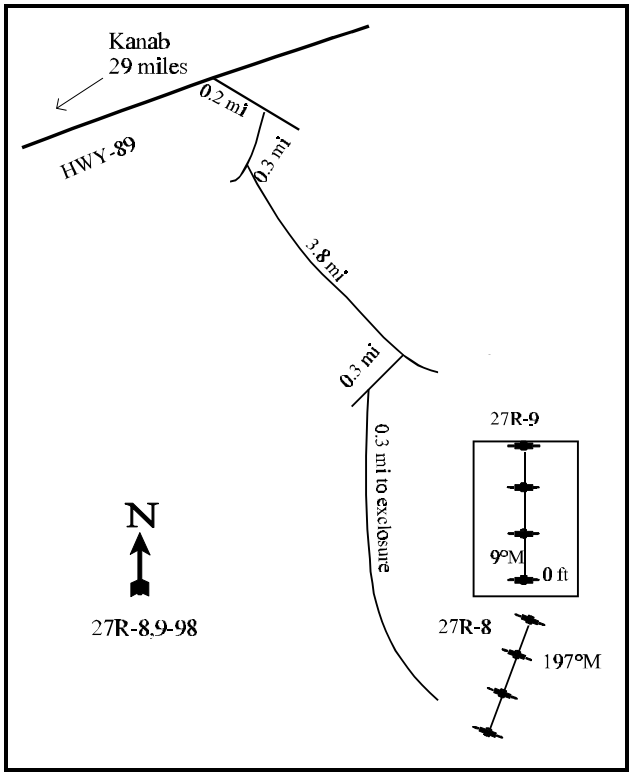
Compass bearing: frequency baseline 9°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95ft), line 2 (59ft), line 3 (34ft & 71ft).

LOCATION DESCRIPTION

From the 90° turn on HWY-89 in Kanab, travel 29 miles on south-89 (traveling east from Kanab) to the Five-mile Mountain turnoff. Turn right and go approximately 0.2 miles to a fork. Stay right at the fork and continue 0.3 miles to another fork. Go left for 3.8 miles to another fork. At the fork, go right for 0.3 miles to the next fork. From here, go right for 0.3 miles to the exclosure on the left. The 0 foot stake of the baseline is located within the exclosure on the south end and can be located by counting down 5 metal posts from the SW corner of the exclosure. Browse tag #107 is attached to the 0 foot stake.





Map Name: Pine Hollow Canyon Diagrammatic Sketch

Township 43S , Range 2W, Section 4 UTM 4106243.659 N, 409583.615 E

DISCUSSION

Trend Study No. 27R-9

This is a new trend study located within the Five Mile Mountain livestock exclosure. It samples a black sagebrush range type with a few scattered Utah juniper trees. Most of the inside of the exclosure was burned a few years ago which eliminated most of the sagebrush. Slope is about 4% with a south aspect. Elevation is about 5,900 feet. Deer use this area mostly during severe winters. Pellet group data estimate 24 deer days use/acre within the exclosure. Rabbits also use the area in significant numbers with quadrat frequency of rabbit pellets nearly twice as high as deer.

Soil within the exclosure is quite different compared to outside with respect to soil texture. Effective rooting depth is similar at just under 8 inches compared to over 8 inches with a hardpan present at about 7-8 inches in depth. However, soil texture is a sand inside the exclosure, but classified as a loam outside. Both phosphorus and potassium appear to be limiting to plant development at just 7.4 ppm and 32 ppm respectively. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. Rock and pavement are common on the surface and within the profile. Due to the abundance of sand and rock in the soil, average temperature of the soil is extremely high at 84.8°F at an average depth of just under 8 inches. This condition causes rapid drying of the soil and gives a competitive advantage to winter annuals like cheatgrass and storksbill. Erosion is not a problem on the site due to the levelness of the terrain.

The site once supported a dense stand of black sagebrush, although a fire which burned a few years ago, eliminated most of the sagebrush. There were some unburned areas sampled near the end of the baseline. Broom snakeweed is the most abundant shrub on the site. It provides 45% of the shrub cover and it is more dense in burned areas. Density is estimated at 4,980 plants/acre. The population appears to have declined since the fire due to the high number of dead plants at 3,420 plants/acre. An additional 990 decadent plants/acre were classified as dying. Reproduction is poor with no seedlings sampled and only 2% of the population consisting of young plants. There are also a few unburned juniper trees in the exclosure which provide 20% of the browse cover or a total cover value of 2%.

Surviving black sagebrush is estimated at 700 plants/acre, 77% of which are mature. Two thirds of the sagebrush are found in the unburned area along belt 4. Utilization of the sagebrush is light to moderate, vigor is generally good with abundant seed stalks, and percent decadence is low at 11%. There is also a few widely scattered cliffrose plants in the exclosure. None were found in the shrub density strips but one plant was measured for height/crown.

The herbaceous understory is poor and dominated by annuals, but to a lesser extent compared to the outside of the exclosure. The annual, cheatgrass, is abundant and accounts for 86% of the grass cover. However, Indian ricegrass and bottlebrush squirreltail were also encountered occasionally. Forbs are depleted with the most abundant species being the annual storksbill, which provides 87% of the forb cover. The only perennial species sampled is globemallow.

1998 APPARENT TREND ASSESSMENT

Soil conditions are poor due to a lack of protective ground cover. Erosion is not a problem, however this is primarily due to the lack of significant slope. The browse composition is also poor due to the fire which burned through most of the exclosure. Burned areas have a higher density of the increaser/invader, broom snakeweed. Currently density is estimated at 4,980 plants/acre, 68% of which are mature. Its population appears to be in a state of decline however, with a large number of dead plants sampled, poor reproduction, poor vigor, and relatively high decadence (30%). Black sagebrush has a density of 700 plants/acre. It shows light to moderate utilization, and generally good vigor and low decadence. The sagebrush should increase over time within the burned areas. The herbaceous understory is poor with annuals dominating. Although,

annuals are at lower numbers and produce less cover in the exclosure when compared to outside, there are still more perennial grasses and forbs inside. Overall, the cheatgrass and storksbill are the dominant species inside as well as outside the exclosure. Cheatgrass provides 86% of the grass cover and storksbill accounts for 87% of the forb cover inside the exclosure. Cheatgrass produces nearly twice as much cover and storksbill accounts for 5 times more cover outside of the exclosure.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 9

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bromus tectorum (a)	371	92	4.94
G	Oryzopsis hymenoides	11	6	.42
G	Sitanion hystrix	5	4	.33
G	Vulpia octoflora (a)	25	9	.04
Total for Annual Grasses		396	101	4.98
Total for Perennial Grasses		16	10	0.75
Total for Grasses		412	111	5.74
F	Eriogonum cernuum (a)	3	1	.00
F	Erodium cicutarium (a)	217	63	1.69
F	Salsola iberica (a)	1	1	.00
F	Sphaeralcea parvifolia	61	25	.25
Total for Annual Forbs		221	65	1.70
Total for Perennial Forbs		61	25	0.25
Total for Forbs		282	90	1.95

BROWSE TRENDS --
Herd unit 27R, Study no: 9

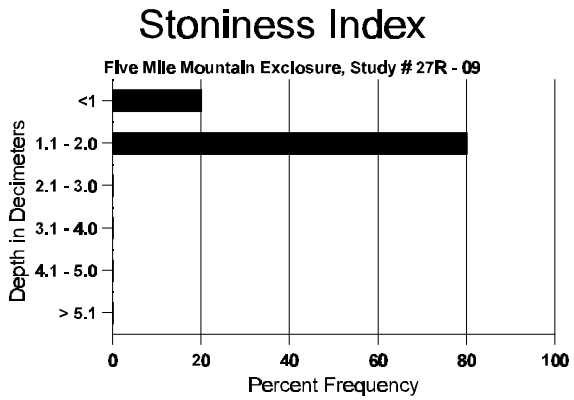
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia nova	21	2.33
B	Cercocarpus ledifolius	0	-
B	Cowania mexicana stansburiana	0	-
B	Gutierrezia sarothrae	67	3.30
B	Juniperus osteosperma	0	1.48
B	Opuntia spp.	1	.15
B	Ribes spp.	0	-
Total for Browse		89	7.26

BASIC COVER --
Herd unit 27R, Study no: 9

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	406	15.70
Rock	276	7.30
Pavement	444	30.46
Litter	420	16.29
Cryptogams	151	2.13
Bare Ground	437	33.09

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 09, Study Name: Five Mile Mountain Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
7.6	84.8 (7.5)	7.2	92.2	2.0	5.8	1.6	7.4	32.0	.5



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 9

Type	Quadrat Frequency '98
Rabbit	13
Deer	7

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia nova																		
Y	98	3	1	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	23	4	-	-	-	-	-	-	-	27	-	-	-	540	19	31	27
D	98	2	2	-	-	-	-	-	-	-	-	-	-	4	80			4
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	380			19
% Plants Showing '98				Moderate Use 20%			Heavy Use 00%				Poor Vigor 11%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		700	Dec:		11%
Cercocarpus ledifolius																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Cowania mexicana stansburiana																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	54	50	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Gutierrezia sarothrae																		
Y	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	170	-	-	-	-	-	-	-	-	170	-	-	-	3400	7	10	170
D	98	75	-	-	-	-	-	-	-	-	9	-	-	66	1500			75
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	3420			171
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 27%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		4980	Dec:		30%
Juniperus osteosperma																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Opuntia spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	22	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ribes spp.																		
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	240			12

% Plants Showing '98	Moderate Use 00%	Heavy Use 00%	Poor Vigor 00%	%Change

Total Plants/Acre (excluding Dead & Seedlings) '98 0 Dec: -

FIVE MILE MOUNTAIN EXCLOSURE COMPARISON SUMMARY

Outside 27R-8 and Inside 27R-9

1998 Comparisons

Ground cover characteristics differ between the outside and inside of the exclosure. Vegetation and litter cover are nearly two times higher outside of the exclosure. Percent bare ground is higher inside at 33% compared to 25% outside. The reason for the difference is primarily due to the more abundant herbaceous understory cover outside (18%) compared to inside the exclosure (8%). Shrub cover is similar between sites. Soil texture may be the reason for some of the difference. Texture is a sand inside and a loam outside of the exclosure. Both sites are deficient in phosphorus and potassium and both have extremely high average soil temperatures. Erosion is not currently a problem on either site however, due to the levelness of the terrain.

Both sites once supported similar browse stands with black sagebrush being the key species. A fire burned much of the area a few years ago and thinned out the sagebrush. Density is higher outside at 2,180 plants/acre where less of the area burned compared to 700 plants/acre inside the exclosure. Use is much heavier outside, where 76% of the sagebrush displayed heavy browsing. Use inside is mostly light to moderate. Pellet group data estimates similar deer use days/acre between grazing treatments (20 ddu outside and 24 ddu inside), suggesting dual use with deer and cows. Sagebrush appears to have a stable population on both sites with generally good vigor, adequate reproduction, and low decadence. The abundant broom snakeweed populations on both sites appear to be in a state of decline.

The herbaceous understories are similar with respect to composition. Annuals, cheatgrass and storksbill, dominate both sites, but to a higher degree outside the exclosure where total herbaceous cover is twice as high. Cover values for cheatgrass are nearly two times higher and storksbill provides 5 times more cover outside the exclosure compared to inside. Perennial grasses are rare on both sites, yet produce more cover inside the exclosure (.13% vs .75%). Nested frequency of perennial forbs is also high inside (61 vs 35). Some of the differences between sites may be due to the sandier soil texture inside of the exclosure.

Trend Study 27R-10-98

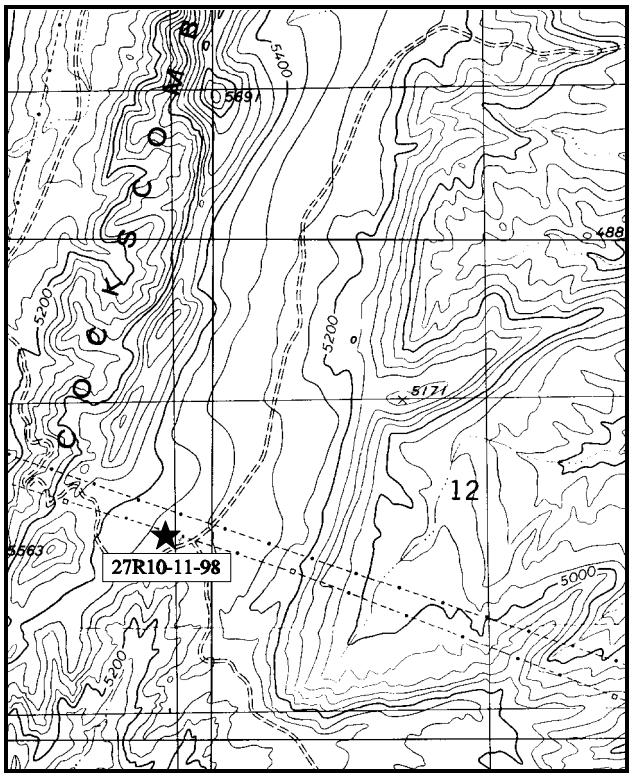
Study site name: Cockscomb Exclosure . Range type: Desert Brush .

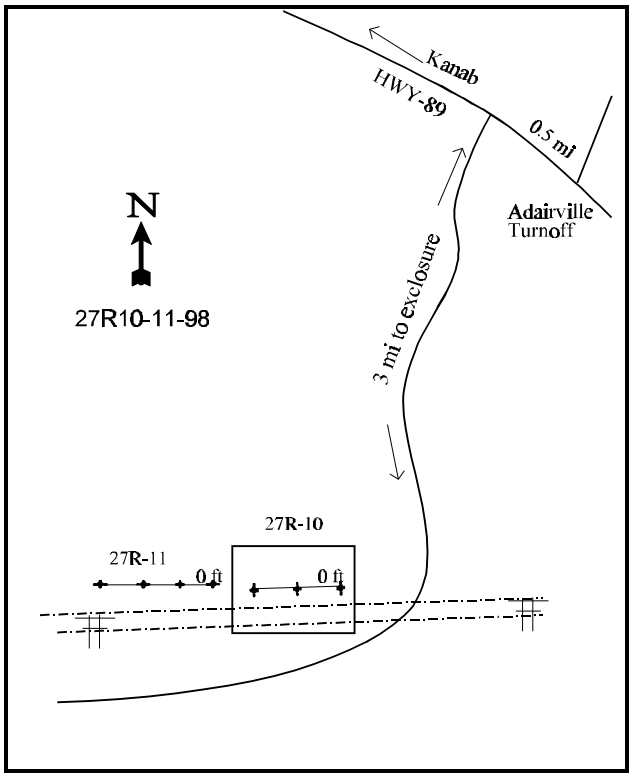
Compass bearing: frequency baseline 261°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft, 59 ft, & 95 ft), line 2 (34ft & 71 ft).

LOCATION DESCRIPTION

From HWY-89 and the Adairville turnoff (east of Kanab on south-89), go 0.5 miles west to a left turn. Turn left here and go 3 miles to an exclosure underneath the power lines. The 0 foot baseline stake is located inside the exclosure on the east side. The 0 foot stake has browse tag #110 attached and can be located by counting up 3 metal posts from the SE corner of the exclosure.





Map Name: West Clark Bench Diagrammatic Sketch

Township 43S , Range 2W , Section 11 UTM 4104556.219 N, 413032.337 E

DISCUSSION

Trend Study No. 27R-10

This is a new trend study placed inside the livestock exclosure. The Cockscomb Exclosure is located about 30 miles east of Kanab and about 7 miles north of the Arizona-Utah border. This is a two-way exclosure (livestock and outside) in the most northern part of a hot desert shrub community. The exclosure is at an elevation of approximately 5,360 feet. It has an east aspect with a slight slope (6-7%). Located beneath a high voltage power line, the exclosure has an area of almost one and a half acres (about 30,000 ft^2). A pellet group transect indicated use at 11 deer use days/acre and also a moderate density of rabbit pellet groups.

Soil textural analysis indicates it to be a sandy clay loam soil with a neutral pH (7.1). Average effective rooting depth (see methods) was estimated at 17 inches with an average soil temperature of 77°F at 17 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 3.3 ppm respectively. This may limit plant development where 10ppm for potassium and 70 ppm for phosphorous are thought to be the minimum. Rocks and pavement were encountered on the soil surface and provide nearly 5% combined cover. Although percent bare ground cover is high (45%), there is little erosion apparent at this time due to the soil texture and the lack of significant slope.

Browse species currently provide 57% of the vegetative cover. The most abundant species include: shinnery oak, yucca, broom snakeweed, and green ephedra. Shinnery oak has an estimated density of 3,120 stems/acre. Most of these plants were classified as mature (74%) and no seedling plants were encountered. Percent decadency is 8% and 75% of these plants were classified as dying. Average cover for shinnery oak is 6%. The dead to live ratio is 1:5. There is no apparent utilization and most plants exhibit good vigor. Yucca has an estimated density of 1,540 plants/acre. Ninety-four percent of the population were classified as mature and the remaining 4% classified as young.

Broom snakeweed has an estimated density of 1,260 plants/acre with an apparent stable population. A majority of the plants were classified as mature (79%) and no seedlings were sampled. Percent decadency is low and the dead to live ratio is currently 1:8, or about 11% are dead. Green ephedra has an estimated density of 1,020 plants/acre. No seedlings were encountered and 71% of the population were classified as mature. All of the decadent plants are also classified as dying. Many of the plants exhibited poor vigor in 1998 (71% of the population). One live and one dead juniper were located within the exclosure. Other browse species scattered throughout the area include: prickly pear cactus, low rabbitbrush, penstemon spp., Ribes spp., sand sagebrush, buckwheat, four wing saltbush, and antelope bitterbrush.

Grasses provide 34% of the total vegetative cover and 79% of the herbaceous understory cover. Cheatgrass provides the most cover and was found in 75% of the quadrats. Six weeks fescue is also present, but relatively less abundant. Needle and thread grass and sandhill muhly are the most abundant perennial species and when combined they account for 35% of the herbaceous understory cover. Other scattered grasses include: Indian ricegrass, sand dropseed, blue grama, bottlebrush squirreltail, and purple threeawn. Forbs are not nearly as abundant with fineleaf hymenopappus and Utah deervetch accounting for 88% of the forb cover.

1998 APPARENT TREND ASSESSMENT

There is currently no erosion apparent on the site, although some pedestaling was noted around some of the shrubs. The soil appears to become very compacted at a depth of about 16-18 inches. Although no seedlings were encountered for any of the browse species, the browse populations appear to be stable considering the harsh environment of the site. None of the browse species exhibited utilization at this time. The herbaceous understory is dominated by cheatgrass and six weeks fescue. Several perennial species are also present and appear to have good vigor.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 10

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	-	-	.00
G	Bouteloua gracilis	16	4	.60
G	Bromus tectorum (a)	276	75	2.73
G	Muhlenbergia pungens	37	12	1.58
G	Oryzopsis hymenoides	21	9	.19
G	Sitanion hystrix	2	1	.03
G	Sporobolus cryptandrus	12	7	.08
G	Stipa comata	31	15	1.49
G	Vulpia octoflora (a)	123	38	.31
Total for Annual Grasses		399	113	3.04
Total for Perennial Grasses		119	48	3.99
Total for Grasses		518	161	7.03
F	Androstephium breviflorum	4	2	.06
F	Arabis spp.	4	2	.01
F	Artemesia carruthii	3	2	.06
F	Hymenopappus filifolius	26	11	1.29
F	Lotus utahensis	12	6	.20
F	Machaeranthera canescens	8	4	.08
F	Oenothera pallida	21	8	.06
F	Sphaeralcea coccinea	9	4	.04
Total for Annual Forbs		0	0	0
Total for Perennial Forbs		87	39	1.82
Total for Forbs		87	39	1.82

BROWSE TRENDS --
Herd unit 27R, Study no: 10

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	1	-
B	Atriplex canescens	0	1.48
B	Chrysothamnus viscidiflorus	2	.15
B	Ephedra viridis	13	1.61
B	Eriogonum spp.	1	-
B	Gutierrezia sarothrae	33	1.47
B	Opuntia spp.	7	.03
B	Penstemon spp.	2	.15
B	Pinus edulis	0	-
B	Purshia tridentata	0	-
B	Quercus havardii	27	5.97
B	Ribes spp.	2	-
B	Yucca spp.	20	.81
Total for Browse		108	11.68

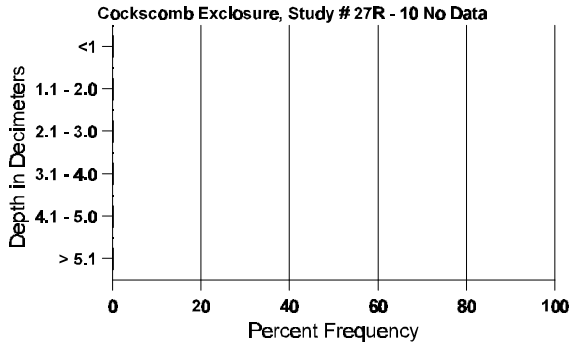
BASIC COVER --
Herd unit 27R, Study no: 10

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	378	21.95
Rock	137	.72
Pavement	223	3.92
Litter	456	31.32
Cryptogams	46	1.33
Bare Ground	384	45.26

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 10, Study Name: Cockscomb Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.3	77.0 (16.8)	7.1	60.2	18.0	21.8	.4	3.3	3.2	.4

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 10

Type	Quadrat Frequency '98
Rabbit	13
Deer	3

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	29	45	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				20	Dec:		-
Atriplex canescens																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	39	111	0
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				0	Dec:		-
Chrysothamnus viscidiflorus																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	24	40	2
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 33%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				60	Dec:		33%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra viridis																		
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	36	-	-	-	-	-	-	-	-	12	-	24	-	720	16	21	36
D	98	12	-	-	-	-	-	-	-	-	-	-	-	12	240			12
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 71%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1020	Dec:		24%
Eriogonum spp.																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Gutierrezia sarothrae																		
Y	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	98	50	-	-	-	-	-	-	-	-	46	-	-	-	1000	10	16	50
D	98	2	-	-	-	-	-	-	-	-	-	-	-	2	40			2
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	180			9
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 03%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1260	Dec:		3%
Opuntia spp.																		
M	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140	7	16	7
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		140	Dec:		-
Penstemon spp.																		
M	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60	16	22	3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Pinus edulis																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	21	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	16	23	0
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Quercus havardii																		
Y	98	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
M	98	115	-	-	-	-	-	-	-	-	115	-	-	-	2300	44	37	115
D	98	12	-	-	-	-	-	-	-	-	3	-	-	9	240			12
X	98	3	-	-	-	-	-	-	-	-	3	-	-	-	820			41
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 06%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		3120	Dec:		8%
Ribes spp.																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	8	11	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Yucca spp.																		
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	74	-	-	-	-	-	-	-	-	72	-	-	-	1480	21	28	74
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%							%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1540	Dec:		-

Trend Study 27R-11-98

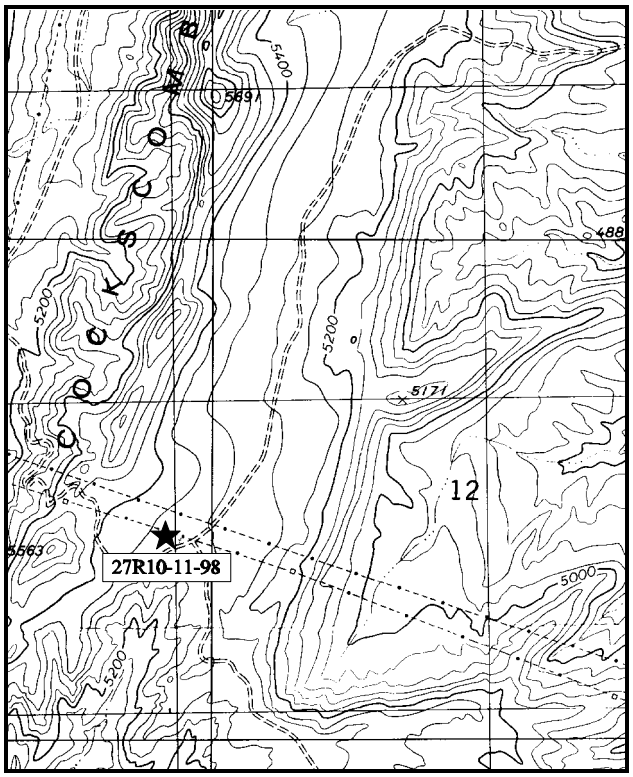
Study site name: Cockscomb Outside . Range type: Desert Brush .

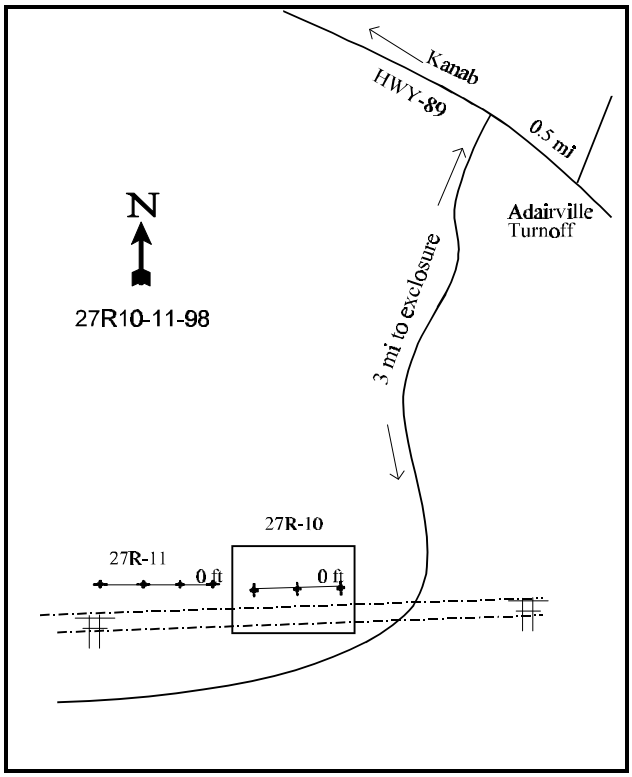
Compass bearing: frequency baseline 270°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft & 95 ft), line 2 (59ft), line 3 (34ft & 71 ft).

LOCATION DESCRIPTION

From HWY-89 and the Adairville turnoff (east of Kanab on south-89), go 0.5 miles west to a left turn. Turn left here and go 3 miles to an exclosure underneath the power lines. The baseline starts on the west side of the exclosure and can be located by counting up to the second metal post from the SW corner.





Map Name: West Clark Bench

Diagrammatic Sketch

Township 43S , Range 2W , Section 11

UTM 4104565.072 N, 412971.257 E

DISCUSSION

Trend Study No. 27R-11

This is a new trend study placed outside the livestock exclosure. The Cockscomb Exclosure is located about 30 miles east of Kanab and about 7 miles north of the Arizona-Utah border. This is a two-way exclosure (livestock and outside) in the most northern reaches of a hot desert shrub community at an elevation of approximately 5,360 feet. The aspect is to the east with a slight slope (6-7%). The site is located beneath a high voltage power line adjacent to the exclosure. A pellet group transect indicated 19 deer use days/acre and 10 cow days use/acre. A moderate density of rabbit pellet groups were also encountered.

Soil textural analysis indicates it to be a sandy loam soil with a neutral pH (6.9). Average effective rooting depth (see methods) is estimated to be 20 inches with an average soil temperature of 79°F at 14 inches. Both potassium and phosphorous measurements were low, 3.2 ppm and 2.7 ppm respectively, and may limit plant development. Values of 10 ppm for potassium and 70 ppm for phosphorous are considered the minimum for normal plant development. Rocks and pavement were encountered on the soil surface and combined they only provided almost 2% cover. Although percent bare ground cover is high (54%), there is little erosion apparent at this time due to the soil texture and the lack of significant slope.

Browse species currently provide 52% of the vegetative cover. The most abundant species include: shinnery oak, green ephedra, penstemon sp., yucca, and broom snakeweed. Shinnery oak has an estimated density of 4,280 stems/acre. Most of these plants are classified as mature (70%) and young (24%). Three seedlings were sampled in 1998. Percent decadency is estimated to 6% with 69% of these plants classified as dying. The dead to live ratio is 1:10, or 9% of the population is dead. Utilization is light and most plants exhibit good vigor. This population currently appears to be a stable. Green ephedra has an estimated density of 1,700 plants/acre. No seedling plants were encountered and 61% of the population were classified as mature. All of the decadent plants exhibited poor vigor and classified as chlorotic or dying. Twenty-two percent of the population exhibited poor vigor in 1998.

A shrubby penstemon spp. was encountered with an estimated density of 860 plants/acre. This is a mostly mature population with only one seedling sampled. No decadent plants were encountered and the dead to live ratio is 1:4 (20% were dead). Yucca has an estimated density of 660 plants/acre. This was also a mostly mature population with 85% of the plants classified as mature and 15% classified as young. Broom snakeweed had an estimated density of 500 plants/acre. Eighty-eight percent of the pants were classified as mature and the remaining 12% classified as young. Other browse species scattered throughout the area include: prickly pear cactus, sand sagebrush, buckwheat, and gray horsebrush.

Grass currently contributes 67% of the herbaceous understory cover. Sandhill muhly is the most abundant of the grass species, followed by Indian ricegrass and sand dropseed. Although annual species percent cover is low, they still account for 50% of the grass sum of nested frequency. Six weeks fescue provides 27% of the grass cover and 18% of the herbaceous understory cover. Cheatgrass is also present but in low abundance.

The forb component is dominated by perennial species that include: Cruciferae spp., fineleaf hymenopappus, and purple funnellily. Other perennial species scattered throughout the site include: bastard toadflax, Utah deervetch, and pale evening primrose. Only one annual forb was encountered (Gilia spp.) and is in low abundance.

1998 APPARENT TREND ASSESSMENT

Erosion is currently minimal with only slight soil movement apparent with some pedestaling noted around some the shrubs. Seedlings were encountered for a few of the browse species (broom snakeweed, buckwheat, penstemon sp., and shinnery oak). All of the browse species exhibited light utilization. With the exception of

green ephedra, all browse species showed good vigor. The herbaceous understory is relatively diverse, although most species were seldom sampled.

HERBACEOUS TRENDS --
Herd unit 27R, Study no: 11

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Aristida purpurea	1	1	.03
G	Bouteloua gracilis	22	9	.17
G	Bromus tectorum (a)	30	11	.13
G	Muhlenbergia pungens	144	47	4.03
G	Oryzopsis hymenoides	31	17	.22
G	Sporobolus cryptandrus	27	12	.36
G	Stipa comata	28	10	.13
G	Stipa lettermani	-	-	.00
G	Vulpia octoflora (a)	218	72	1.85
Total for Annual Grasses		248	83	1.98
Total for Perennial Grasses		253	96	4.96
Total for Grasses		501	179	6.95
F	Androstephium breviflorum	55	23	.40
F	Arabis spp.	3	1	.00
F	Artemesia carruthii	4	2	.18
F	Comandra pallida	21	7	.13
F	Cruciferae	32	16	1.14
F	Cryptantha spp.	7	4	.07
F	Erigeron pumilus	2	1	.00
F	Gilia spp. (a)	10	3	.04
F	Hymenopappus filifolius	53	21	.95
F	Lotus utahensis	18	8	.17
F	Machaeranthera canescens	5	3	.05
F	Oenothera pallida	20	8	.16
F	Phlox longifolia	3	1	.00
F	Sphaeralcea coccinea	1	1	.00
F	Sphaeralcea parvifolia	3	2	.01
F	Townsendia spp.	9	5	.02
F	Unknown forb-perennial	4	2	.03
Total for Annual Forbs		10	3	0.03
Total for Perennial Forbs		240	105	3.37
Total for Forbs		250	108	3.41

BROWSE TRENDS --

Herd unit 27R, Study no: 11

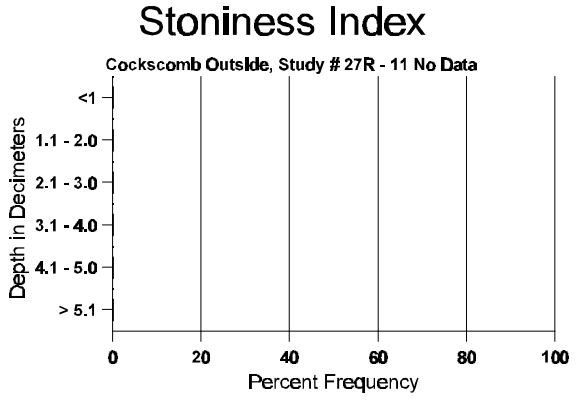
Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	8	-
B	Ephedra viridis	24	1.70
B	Eriogonum spp.	14	.89
B	Gutierrezia sarothrae	18	.43
B	Juniperus osteosperma	-	.18
B	Opuntia polyacantha	5	.06
B	Penstemon spp.	22	.90
B	Quercus havardii	36	7.11
B	Tetradymia canescens	1	.15
B	Yucca spp.	9	-
Total for Browse		137	11.43

BASIC COVER --
Herd unit 27R, Study no: 11

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	370	31.28
Rock	42	.28
Pavement	130	1.41
Litter	466	33.50
Bare Ground	435	53.82

SOIL ANALYSIS DATA --
Herd Unit 27R, Study # 11, Study Name: Cockscomb Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
19.7	79.3 (14.2)	6.9	72.2	18.0	9.84	.3	2.7	3.2	.3



PELLET GROUP FREQUENCY --
Herd unit 27R, Study no: 11

Type	Quadrat Frequency '98
Rabbit	18
Deer	12
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 27R, Study no: 11

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
M	98	9	-	-	-	-	-	-	-	-	9	-	-	-	180	26	27	9
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		-
Ephedra viridis																		
Y	98	28	-	-	-	-	-	2	-	-	29	-	1	-	600			30
M	98	37	7	-	7	-	-	1	-	-	37	-	15	-	1040	14	18	52
D	98	3	-	-	-	-	-	-	-	-	-	-	1	2	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6
% Plants Showing '98				Moderate Use 08%			Heavy Use 00%				Poor Vigor 22%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1700	Dec:		4%
Eriogonum spp.																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	15	-	-	1	-	-	-	-	-	16	-	-	-	320	14	25	16
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		320	Dec:		-
Gutierrezia sarothrae																		
S	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
M	98	22	-	-	-	-	-	-	-	-	22	-	-	-	440	8	13	22
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		500	Dec:		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia polyacantha																		
M	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120	7	11	6
D	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		33%
Penstemon spp.																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	98	35	-	-	-	-	-	1	-	-	36	-	-	-	720	16	21	36
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	280			14
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		860	Dec:		-
Quercus havardii																		
S	98	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	98	52	-	-	-	-	-	-	-	-	52	-	-	-	1040			52
M	98	121	10	-	18	-	-	-	-	-	146	-	3	-	2980	29	22	149
D	98	10	2	-	1	-	-	-	-	-	3	-	1	9	260			13
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	460			23
% Plants Showing '98				Moderate Use 06%			Heavy Use 00%				Poor Vigor 06%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		4280	Dec:		6%
Tetradymia canescens																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11	30	0
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%
Yucca spp.																		
Y	98	5	-	-	-	-	-	-	-	-	5	-	-	-	100			5
M	98	28	-	-	-	-	-	-	-	-	28	-	-	-	560	17	22	28
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		660	Dec:		-

COCKSCOMB EXCLOSURE COMPARISON SUMMARY

Inside 29R-10 Outside 29R-11

1998 Comparisons

Ground cover characteristics differ slightly between inside and outside the exclosure. Percent vegetative cover was higher outside the exclosure (31%) than inside the exclosure (22%). Conversely, percent rock and pavement cover combined were higher inside (5%) than outside (2%). Percent litter cover is similar inside and outside (31% and 34% respectively), while percent bare ground cover is greater outside (54% vs 45%).

Soil texture characteristics differ in that inside the exclosure it is a sandy clay loam and outside it is a sandy loam. Average effective rooting depth and soil temperature are similar and both grazing treatments have low phosphorous and potassium levels that may be limiting to plant development. Erosion is negligible on both sites due to the soil texture and levelness of the site.

The most abundant browse on both treatments is shinnery oak. Inside it has an estimated density of 3,120 stems/acre, while outside it has an estimated density of 4,280 stems/acre. The plants inside are slightly taller (44 inches) than the plants outside (29 inches). These are both mostly mature populations with few seedlings present. Utilization is light on all plants. Pellet group data estimates 19 deer days use/acre outside and 11 deer days use/acre inside. Cow use outside is estimated to be 10 cow days/acre. Broom snakeweed density is higher inside the exclosure (1,260 plants/acre) than outside the exclosure (500 plants/acre). Both populations are mostly mature with no seedlings encountered inside the exclosure and an estimated 120 seedlings/acre outside the exclosure. Conversely, green ephedra density is greater outside the exclosure (1,700 plants/acre) than inside the exclosure (1,020 plants/acre). Also, the plants inside the exclosure were in poorer health than the plants outside the exclosure.

Herbaceous understory species richness and sum of nested frequency is greater outside the exclosure with (25 and 751 respectively vs 16 and 605 respectively). Grasses provide the bulk of the herbaceous understory cover for both grazing treatments. Both sites have the same number of grasses, but outside the exclosure has 9 more perennial species. Annual species sum of nested frequency is greater than perennial species sum of nested frequency inside the exclosure. The converse is true for outside the exclosure. Inside the exclosure, cheatgrass nested frequency is more than double that of six weeks fescue. Conversely, outside the exclosure, six weeks fescue nested frequency is more than seven times greater.

Trend Study 29R-1-98

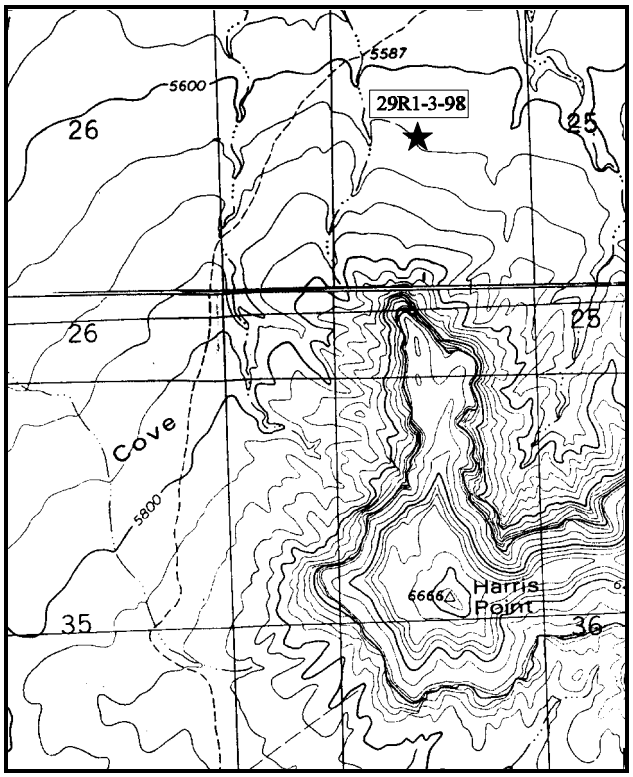
Study site name: Elephant Gap Total Exclosure . Range type: Pinyon-Juniper .

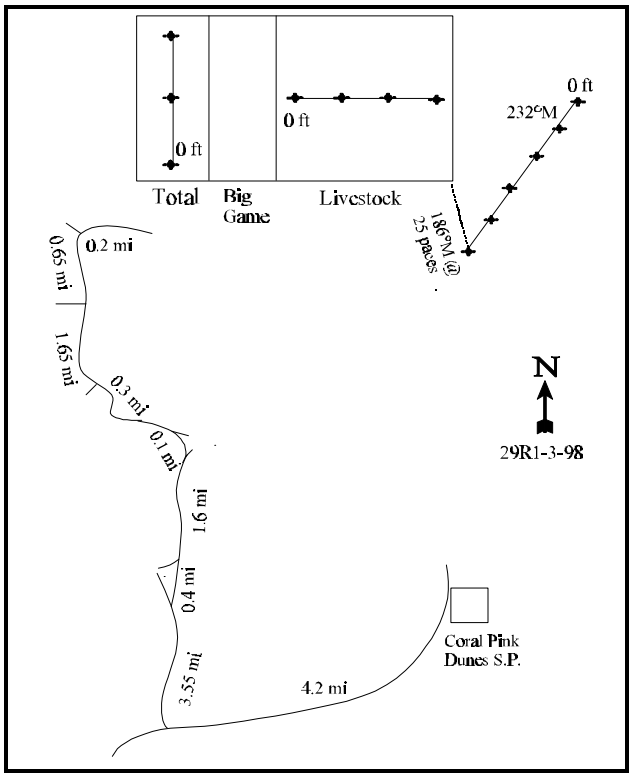
Compass bearing: frequency baseline 50°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft, 59 ft, and 95 ft), line 2 (34ft and 71 ft).

LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park. From the entry to the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 0.4 miles where the road splits. At the split, stay right again and go 1.6 miles to a fork. Go left at the fork for 0.1 miles to the next fork staying left again and continuing 0.3 miles to another fork. Go right for 1.65 miles to the next fork, stay right then continue for 0.65 miles to another fork. From here, turn right and go 0.2 miles to the exclosure. The total exclosure is nearest the road, and the baseline (200 feet long) runs through the middle at 50°M. Browse tag #116 is attached to the 0 foot stake.





Map Name: The Barracks Diagrammatic Sketch

Township 42S , Range 9W , Section 25 UTM 4110568.401 N, 339642.612 E

DISCUSSION

Trend Study No. 29R-1

This is a new trend study established in 1998 within the Elephant Gap game/livestock exclosure which is located about 9 miles northwest of the Coral Pink San Dunes and just north of Harris Point. This, along with the John R Flat and Nephi Pasture exclosures, was built in the 1960's. They all are three way exclosures consisting of a total (game/livestock) and livestock grazing exclosure, and a site placed outside of the exclosure. The total exclosure is approximately 100 by 200 feet in size. Slope is about 6% with a north to northwest aspect. Elevation is about 5,630 feet. The area supports a moderately dense stand of pinyon and juniper trees with mixture of basin big sagebrush, bitterbrush, and serviceberry in the understory.

Soil at the site is moderately deep with an effective rooting depth (see methods) estimated at just over 31 inches. Texture is a sand, with a slightly acid pH (6.2). Phosphorus and potassium are limited at just 5.6 ppm and 12.8 ppm respectively. This could be effecting plant growth and development. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. Average soil temperature is high at 71°F at a depth of 18 inches. This combined with the sandy nature of the soil cause rapid drying of the soil profile which effectively limits shallow rooted plants. There is no rock or pavement on the surface or within the profile. A considerable amount of bare ground is exposed (38%), but there is little erosion occurring due to the gentle slope and the rapid infiltration capacity of the soil.

There are six small pinyon pine and six large Utah juniper trees inside of the total exclosure. Average basal diameter was approximately 14 inches for juniper and 4 inches for pinyon. Juniper provides 38% of the shrub cover on the site and overhead canopy cover averages 12%. Basin big sagebrush and bitterbrush are the key browse species. They provide respectively 31% and 17% of the shrub cover. Density of basin big sagebrush is estimated at 1,280 plants/acre. The population appears healthy with good reproduction, generally good vigor, and low percent decadence at 19%. There are only 240 bitterbrush plants/acre estimated, however 92% are large mature shrubs measuring 4 feet in height with a crown diameter of 5 feet. There were no seedlings or young sampled, but vigor is good on most plants and percent decadence is low at 8%. Small numbers of sand sagebrush, rubber rabbitbrush, green ephedra, coin buckwheat, squawbush, and yucca are also found inside of the exclosure.

The herbaceous understory is very poor. Total herbaceous cover is estimated at only 6%. The most common perennial species consist of warm season species, blue grama and sand drop seed. These two species account for 93% of the grass cover. There is some cheatgrass present, although it was sampled in only two quadrats. Forbs are slightly more common with a milkvetch and pale evening primrose being the most abundant. This level of grass and forb abundance may be all that this site is capable of supporting due to the high sand content of the soil.

1998 APPARENT TREND ASSESSMENT

The soil trend appears relatively stable even with the abundance of bare soil. There is some soil pedestaling apparent, but soil erosion appears minimal due to the gentle terrain combined with the high infiltration capacity of the soil. The key browse species, basin big sagebrush and bitterbrush, appear to have healthy and stable populations. Vigor is normal on most plants and percent decadency is low at 19% for sagebrush and 8% for bitterbrush. The herbaceous understory is lacking, although this may be all the site can support. Composition of grasses is dominated by the warm season species, blue grama, and sand dropseed. Forb composition is composed mostly of milkvetch and pale evening primrose.

HERBACEOUS TRENDS --
Herd unit 29R, Study no: 1

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	51	21	1.21
G	Bromus tectorum (a)	4	2	.01
G	Muhlenbergia pungens	2	1	.03
G	Oryzopsis hymenoides	2	1	.03
G	Sporobolus cryptandrus	39	15	.77
G	Stipa comata	5	1	.00
G	Vulpia octoflora (a)	20	9	.09
Total for Annual Grasses		24	11	0.10
Total for Perennial Grasses		99	39	2.04
Total for Grasses		123	50	2.15
F	Artemisia dracunculus	5	2	.01
F	Astragalus spp.	60	27	1.92
F	Descurainia pinnata (a)	7	3	.16
F	Dithyrea wislizeni (a)	10	4	.27
F	Eriogonum cernuum (a)	9	4	.02
F	Gilia spp. (a)	6	2	.03
F	Lappula occidentalis (a)	3	2	.03
F	Oenothera pallida	43	17	1.06
Total for Annual Forbs		35	15	0.52
Total for Perennial Forbs		108	46	3.00
Total for Forbs		143	61	3.52

BROWSE TRENDS --
Herd unit 29R, Study no: 1

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	15	.62
B	Artemisia tridentata tridentata	37	6.46
B	Chrysothamnus nauseosus albicaulis	9	1.19
B	Chrysothamnus parryi howardi	0	-
B	Ephedra viridis	6	.56
B	Eriogonum nummulare	5	.33
B	Juniperus osteosperma	1	7.94
B	Opuntia spp.	1	.03
B	Purshia tridentata	9	3.56
B	Rhus trilobata trilobata	1	-
B	Yucca spp.	3	.16
Total for Browse		87	20.88

CANOPY COVER --
Herd unit 29R, Study no: 1

Species	Percent Cover '98
Juniperus osteosperma	12

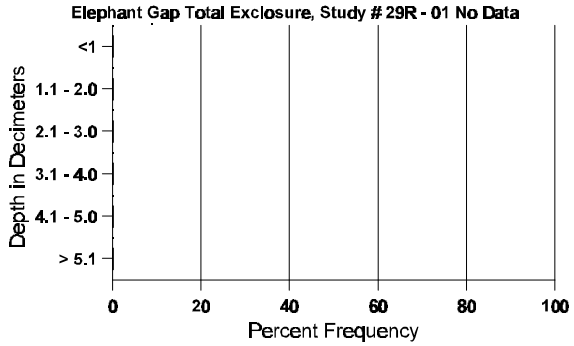
BASIC COVER --
Herd unit 29R, Study no: 1

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	216	28.10
Litter	438	44.43
Cryptogams	150	5.10
Bare Ground	319	38.44

SOIL ANALYSIS DATA --
Herd Unit 29R, Study # 01, Study Name: Elephant Gap Total Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
31.4	70.6 (17.7)	6.2	90.7	4.7	4.6	.6	5.6	12.8	.3

Stoniness Index



PELLET GROUP FREQUENCY --
Herd unit 29R, Study no: 1

Type	Quadrat Frequency '98
Rabbit	2
Deer	1

BROWSE CHARACTERISTICS --
Herd unit 29R, Study no: 1

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
Y	98	5	-	-	1	-	-	-	-	-	6	-	-	-	120			6
M	98	13	-	-	-	-	-	-	-	-	13	-	-	-	260	24	63	13
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		380	Dec:		-
Artemisia tridentata tridentata																		
S	98	4	-	-	2	-	-	-	-	-	6	-	-	-	120			6
Y	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220			11
M	98	39	-	-	2	-	-	-	-	-	41	-	-	-	820	35	45	41
D	98	12	-	-	-	-	-	-	-	-	4	-	-	8	240			12
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	560			28
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 13%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1280	Dec:		19%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus albicaulis																		
M	98	120	-	-	-	-	-	-	-	-	120	-	-	-	2400	38	80	120
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		2400	Dec:		-
Chrysothamnus parryi howardi																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	48	86	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Ephedra viridis																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	3	-	-	-	-	-	-	-	-	2	1	-	-	60	28	26	3
D	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		160	Dec:		38%
Eriogonum nummulare																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	22	23	4
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		120	Dec:		-
Juniperus osteosperma																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	14	0
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Purshia tridentata																		
M	98	11	-	-	-	-	-	-	-	-	11	-	-	-	220	48	64	11
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 08%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		240	Dec:		8%
Rhus trilobata trilobata																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Yucca spp.																		
M	98	2	-	-	1	-	-	-	-	-	3	-	-	-	60	33	42	3
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 00%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-

Trend Study 29R-2-98

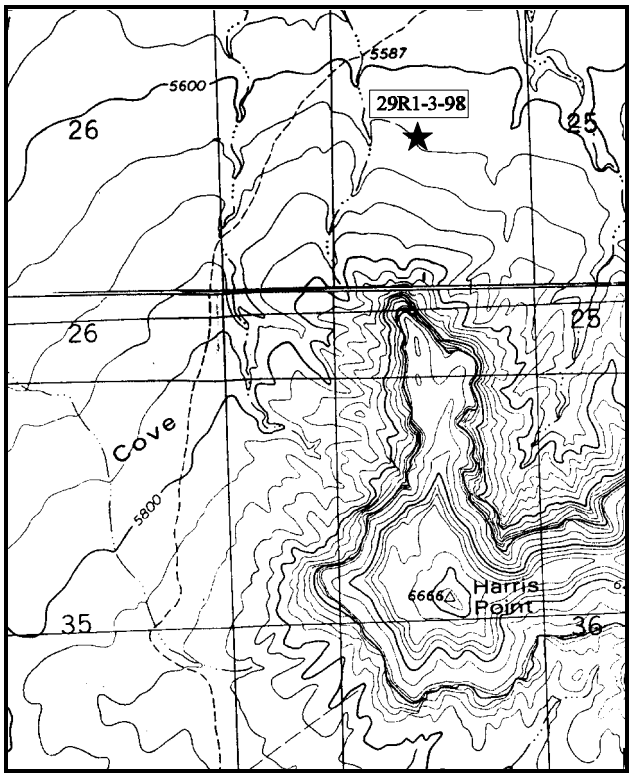
Study site name: Elephant Gap Livestock Exclosure. Range type: Pinyon-Juniper .

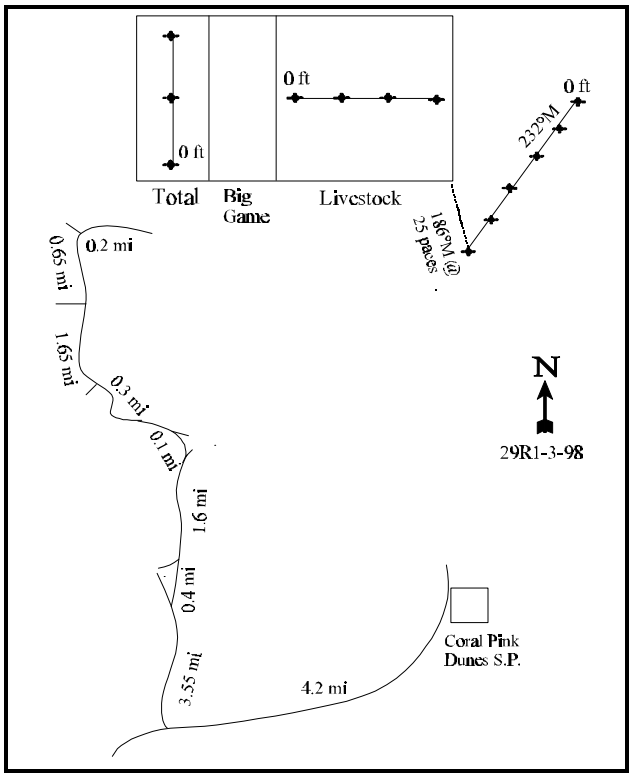
Compass bearing: frequency baseline___degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft and 95 ft), line 2 (59ft), line 3 (34 ft and 71 ft).

LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park. From the entry to the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 0.4 miles where the road splits. At the split, stay right again and go 1.6 miles to a fork. Go left at the fork for 0.1 miles to the next fork staying left again and continuing 0.3 miles to another fork. Go right for 1.65 miles to the next fork, stay right then continue for 0.65 miles to another fork. From here, turn right and go 0.2 miles to the exclosure. The livestock exclosure is located on the east side of the exclosure complex. The baseline starts inside the livestock exclosure near the taller fence denoting the big game exclosure and runs through the middle of the exclosure (see map below).





Map Name: The Barracks Diagrammatic Sketch

Township 42S , Range 9W , Section 25 UTM NO GPS

DISCUSSION

Trend Study No. 29R-2

This is a new trend study established in 1998 within the Elephant Gap livestock exclosure. It is located about 100 feet east of the total exclosure. Slope is 7% with a northwest aspect. Elevation is approximately 5,630 feet. The area is composed of an open pinyon-juniper woodland with a mixed shrub understory. Deer use this area as winter range and pellet group data estimate a high level of use within the livestock exclosure at 96 deer days use/acre. Very little rabbit sign was encountered.

Soil in the livestock exclosure is very similar to the total exclosure and outside. It is moderately deep with an effective rooting depth (see methods) estimated at nearly 26 inches. Sol texture is a sand with a strongly acid pH (5.5). Phosphorus and potassium are limited at just 3.8 ppm and 3.2 ppm respectively which may be limiting to plant growth and development. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. There is very little rock or pavement on the surface or within the profile. Percent bare ground is similar to the total exclosure at 35%, but cryptogamic cover is more than two times greater (5% vs 12%). Average soil temperature is high at 71°F at 18 inches. This combined with the sandy nature of the soil cause rapid drying of the soil profile, which effectively limits shallow rooted plants. There is some soil pedestaling around shrubs, but erosion does not appear to be a problem due to the gentle terrain and high infiltration capacity of the soil.

Total shrub cover is similar to the total exclosure yet composition differs. The key browse species consist of basin big sagebrush and green ephedra which account respectively for 24% and 41% of the browse cover. Bitterbrush is also found in small numbers. Basin big sagebrush, within the livestock exclosure, appears to be in a state of decline. It has an estimated population of 1,180 plants/acre. Dead plants are common (1,060 plants/acre) and are nearly as abundant as live plants. In addition, 46% of the population is decadent and nearly half of the decadent shrubs (260 plants/acre) were classified as dying. Some seedlings and young plants were found, but not in sufficient numbers to maintain the current population. Utilization of the sagebrush is mostly light with 15% of the plants sampled displaying moderate use.

Green ephedra is abundant at 1,060 plants/acre. Mature plants are large averaging over 4 feet in height with a crown diameter of nearly 7 feet making some portions of plants partly unavailable to browsing. Utilization of these shrubs is light. Bitterbrush density was estimated at only 60 plants/acre. Most (67%) are young plants. Utilization is light and vigor good. Other shrubs found on the site include: sand sagebrush, coin buckwheat, prickly pear cactus, and yucca. Juniper trees are scattered in the livestock exclosure. Point quarter data estimate 29 juniper trees/acre with an average basal diameter of 7.3 inches. Overhead canopy cover averages only 4%.

The grass composition is similar to the total exclosure, although forbs are more abundant and diverse in the livestock exclosure exclosure. Grasses combine to produce only 2% cover. Sand dropseed is the most abundant, producing 55% of the grass cover. The only other species which occurs more than rarely is six weeks fescue. Eighteen annual and perennial forbs were classified on the site, combining to produce 11% cover. The most common species include pale and prairie evening primrose, milkvetch, and bastard toad flax. All other species produce less than 1/4 of 1% cover.

1998 APPARENT TREND ASSESSMENT

Soil at the site appears stable. There is a high amount of bare soil (35%), but erosion is minimal due to the gentle terrain combined with the high infiltration capacity of the soil. The key browse species include basin big sagebrush and green ephedra. Sagebrush appears to be in a state of decline even though utilization is mostly light. However, 48% of the population is dead, 46% are decadent, and nearly half (48%) of the decadent sagebrush appear to be dying. Reproduction is poor and not adequate to maintain the stand at

current levels. The less preferred green ephedra population is healthy and appears to be increasing. Utilization is light, vigor normal and percent decadence low at only 2%. Probably the most preferred shrub on the site is antelope bitterbrush, but it only occurs in small numbers within the livestock exclosure. The population is mostly young and lightly utilized. The herbaceous understory is similar to the total exclosure with respect to the grass diversity and abundance. Sand dropseed is the most abundant species followed by six weeks fescue. Forbs are more diverse and produce three times more cover compared to the total exclosure. Common species include: pale and prairie evening primrose, milkvetch, and bastard toadflax.

HERBACEOUS TRENDS --
Herd unit 29R, Study no: 2

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	7	3	.30
G	Bromus tectorum (a)	11	5	.08
G	Muhlenbergia pungens	4	2	.01
G	Oryzopsis hymenoides	3	1	.06
G	Sitanion hystrix	1	1	.00
G	Sporobolus cryptandrus	34	19	1.11
G	Vulpia octoflora (a)	51	18	.44
Total for Annual Grasses		62	23	0.52
Total for Perennial Grasses		49	26	1.49
Total for Grasses		111	49	2.01
F	Artemisia dracunculus	2	1	.06
F	Astragalus spp.	56	22	1.74
F	Castilleja linariaefolia	-	-	.03
F	Chaenactis douglasii	5	2	.03
F	Comandra pallida	88	31	1.35
F	Cordylanthus parviflorus	5	3	.09
F	Descurainia pinnata (a)	16	7	.11
F	Dithyrea wislizeni (a)	4	2	.09
F	Draba spp. (a)	13	4	.07
F	Eriogonum cernuum (a)	11	5	.12
F	Euphorbia spp.	14	5	.02
F	Gilia spp. (a)	1	1	.03
F	Lappula occidentalis (a)	-	-	.00
F	Oenothera albicaulis (a)	18	7	.60
F	Oenothera pallida	155	61	6.51
F	Phlox longifolia	2	1	.00
F	Sphaeralcea grossulariaefolia	6	3	.16
F	Sphaeralcea parvifolia	5	2	.06

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
Total for Annual Forbs		63	26	1.03
Total for Perennial Forbs		338	131	10.07
Total for Forbs		401	157	11.11

BROWSE TRENDS --
Herd unit 29R, Study no: 2

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	3	.93
B	Artemisia tridentata tridentata	47	4.79
B	Ephedra viridis	23	8.32
B	Eriogonum nummulare	1	.03
B	Juniperus osteosperma	1	5.21
B	Opuntia spp.	2	-
B	Purshia tridentata	2	.66
B	Yucca spp.	2	.15
Total for Browse		81	20.11

CANOPY COVER --
Herd unit 29R, Study no: 2

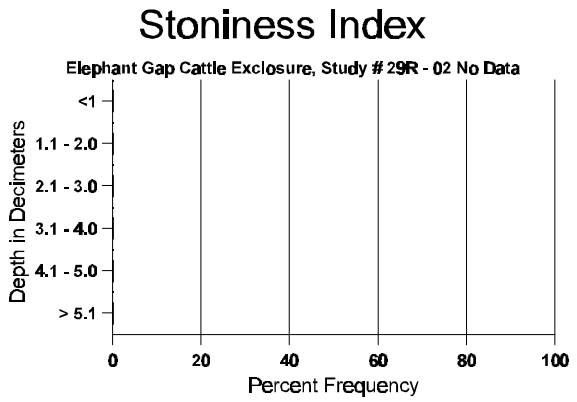
Species	Percent Cover '98
Juniperus osteosperma	5

BASIC COVER --
Herd unit 29R, Study no: 2

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	291	37.53
Rock	2	.00
Pavement	16	.08
Litter	472	42.49
Cryptogams	200	13.53
Bare Ground	308	34.80

SOIL ANALYSIS DATA --
Herd Unit 29R, Study # 02, Study Name: Elephant Gap Cattle Exclosure

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
25.7	70.8 (17.7)	5.5	90.7	2.7	6.6	.6	3.8	3.2	.8



PELLET GROUP FREQUENCY --
Herd unit 29R, Study no: 2

Type	Quadrat Frequency '98
Deer	47

BROWSE CHARACTERISTICS --
Herd unit 29R, Study no: 2

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	47	51	1
D	98	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
% Plants Showing '98		Moderate Use 00%		Heavy Use 00%		Poor Vigor 33%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				60	Dec:		67%
Artemisia tridentata tridentata																		
S	98	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
M	98	22	4	-	2	-	-	-	-	-	28	-	-	-	560	37	38	28
D	98	19	5	-	3	-	-	-	-	-	13	-	1	13	540			27
X	98	1	-	-	-	-	-	-	-	-	-	-	-	-	1060			53
% Plants Showing '98		Moderate Use 15%		Heavy Use 00%		Poor Vigor 24%									%Change			
Total Plants/Acre (excluding Dead & Seedlings)											'98				1180	Dec:		46%
Ephedra viridis																		

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	98	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
Y	98	24	-	-	4	-	-	-	-	-	28	-	-	-	560			28
M	98	22	-	-	2	-	-	-	-	-	24	-	-	-	480	52	81	24
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		1060	Dec:		2%
Eriogonum nummulare																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	26	35	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Juniperus osteosperma																		
M	98	-	-	-	-	-	-	-	1	-	1	-	-	-	20	-	-	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
M	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40	4	9	2
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		-
Purshia tridentata																		
Y	98	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	36	44	1
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		60	Dec:		-
Yucca spp.																		
Y	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80	24	17	4
% Plants Showing '98		Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%								%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		100	Dec:		-

Trend Study 29R-3-98

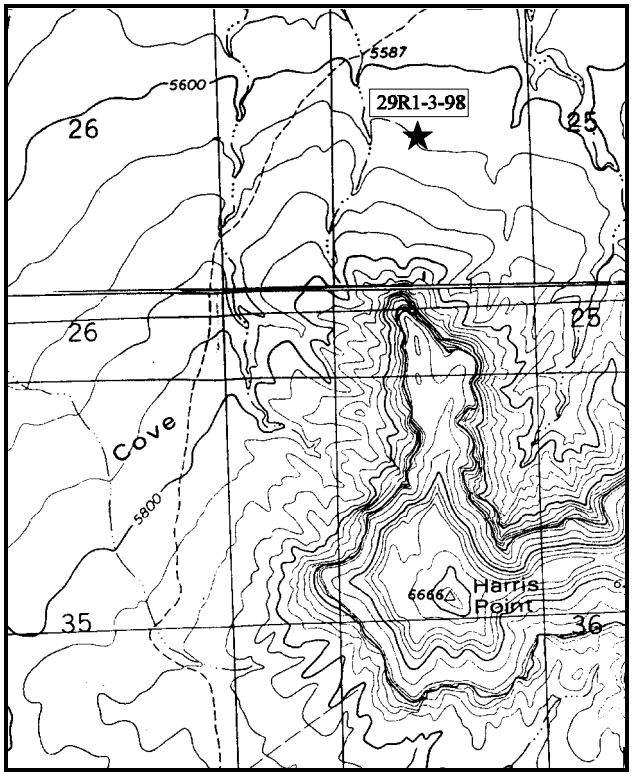
Study site name: Elephant Gap Outside . Range type: Pinyon-Juniper .

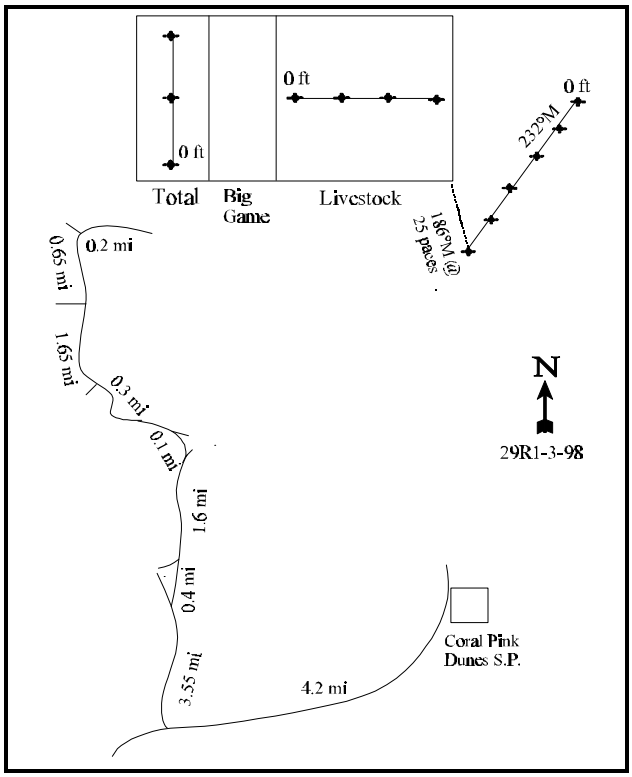
Compass bearing: frequency baseline 232°M degrees.

Footmark (first frame placement) 5 feet. Frequency belt placement; line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

The starting point for this site is the entry to Coral Pink Sand Dunes State Park. From the entry to the park, travel south for 4.2 miles. Turn right and go 3.55 miles to a fork. Stay right and continue 0.4 miles where the road splits. At the split, stay right again and go 1.6 miles to a fork. Go left at the fork for 0.1 miles to the next fork staying left again and continuing 0.3 miles to another fork. Go right for 1.65 miles to the next fork, stay right then continue for 0.65 miles to another fork. From here, turn right and go 0.2 miles to the exclosure. From the southeast corner of the livestock exclosure, the 500 foot stake of the baseline is located 25 paces away at an azimuth of 186°M. The 0 foot stake is located 500 feet to the northeast at a bearing of 128°M. Browse tag #117 is attached to the 0 foot stake.





Map Name: The Barracks Diagrammatic Sketch

Township 42S , Range 9W , Section 25 UTM NO GPS

DISCUSSION

Trend Study No. 29R-3

This is a new trend study established in 1998 outside of the Elephant Gap exclosure. It is located about 100 feet east of the livestock exclosure. The site has a Slope of 7% with a northwest aspect and an elevation of approximately 5,630 feet. The area is composed of an open pinyon-juniper woodland with a mixed shrub understory. Deer use this area as winter range. Pellet group data estimate a similar high level of use for the "outside" when compared to the livestock exclosure (95 days use/acre). There was little rabbit or cow sign observed in the area.

Soil outside the exclosure is very similar to the total exclosure and livestock exclosure. It is moderately deep with an effective rooting depth (see methods) estimated at 26 inches. Soil texture is a sand with a strongly acidic pH (5.4). Phosphorus and potassium are in limited amounts at just 3.5 ppm and 51.2 ppm respectively, which may be limiting to plant growth and development. Values below 10 ppm for phosphorus and 70 ppm for potassium are considered deficient. There is very little rock or pavement on the surface or within the profile. Percent bare ground is higher than the total exclosure or the livestock exclosure at 46%. Cryptogamic cover is similar to the livestock exclosure at 11%. Average soil temperature is fairly high at 69°F at a depth of 18 inches. This combined with the sandy nature of the soil cause rapid drying of the soil profile which effectively limits the establishment of shallow rooted plants. There is some soil pedestaling round shrubs, but erosion does not appear to be a significant problem due to the gentle terrain and high infiltration capacity of the soil.

The key browse species include: basin big sagebrush, green ephedra, and antelope bitterbrush. Sagebrush provides 36% of the browse cover, with a total cover value of 5%. Density is estimated at 1,520 plants/acre. Utilization is light to moderate with a few plants displaying heavy use. However, nearly half (45%) of the population is decadent and 62% of the decadent plants appear to be dying. Dead sagebrush are also abundant accounting for 38% of the population. Reproduction is fairly good with a biotic potential of 5% and young plants accounting for 14% of the population. Nevertheless, this is still not sufficient to maintain the current population.

Ephedra is estimated at 320 plants/acre. Mature plants are large, averaging 3 ½ feet in height and a crown diameter of nearly 7 feet. Available plants show light to moderate use. The population appears healthy with 44% of the population consisting of young plants and percent decadence low at 19%.

Bitterbrush is the most preferred species on the site. However, it occurs in very small numbers estimated at only 20 plants/acre. The only plant sampled was heavily hedged and measured only 11 inches in height with a crown diameter of 26 inches. Other shrubs occurring in limited numbers include: sand sagebrush, true mountain mahogany, rubber rabbitbrush, coin buckwheat, prickly pear, yucca, and gray horsebrush. Gray horsebrush was not found in the total exclosure or livestock exclosure. Juniper and pinyon trees are found scattered throughout the area. Point quarter data estimates 29 Utah juniper and 24 pinyon pine trees/acre. Average basal diameter is 9.8 inches for juniper and 5.5 inches for pinyon. Overhead canopy cover is 4% for juniper and 1% for pinyon.

The herbaceous understory is similar to the livestock exclosure with respect to composition and cover. Grasses provide 2% cover with similar amounts of blue grama , sand dropseed, and the annual, six weeks fescue. Forbs are diverse with 16 species identified. They produce 12% cover. Common species include bastard toad flax, pale evening primrose, prairie evening primrose, and spectacle-pod.

1998 APPARENT TREND ASSESSMENT

Soil condition is poor with a considerable amount of bare ground (46%). There is some soil pedestaling evident around shrubs, but erosion is minimal due to the lack of slope combined with the high infiltration capacity of the sandy soil. The browse trend is very similar to the livestock exclosure. Basin big sagebrush appears to be in a state of decline with abundant dead plants, high decadence, and poor vigor on 62% of the decadent plants. Reproduction is fairly good with a biotic potential of 5% and 14% of the population being young. However, the current density of young plants is insufficient to replace decadent/dying plants. The population could maintain itself with better recruitment in the future. Ephedra appears to be increasing with 44% of the population consisting of young plants. Utilization is light to moderate, vigor good, and percent decadence low at 19%. The more preferred bitterbrush occurs in very limited numbers. Understandably, the one plant sampled was heavily hedged. The herbaceous understory is very similar to the livestock exclosure. Grasses provide only 2% cover with equal amounts of sand drop seed, blue grama, and six weeks fescue (an annual). Forbs combine to produce 12% cover with the most common species being pale evening primrose, prairie evening primrose, and milk vetch.

HERBACEOUS TRENDS --
Herd unit 29R, Study no: 3

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
G	Bouteloua gracilis	10	3	.53
G	Bromus tectorum (a)	20	11	.10
G	Oryzopsis hymenoides	1	1	.03
G	Sitanion hystrix	1	1	.03
G	Sporobolus cryptandrus	40	15	.68
G	Vulpia octoflora (a)	106	33	.68
Total for Annual Grasses		126	44	0.79
Total for Perennial Grasses		52	20	1.27
Total for Grasses		178	64	2.06
F	Ambrosia spp.	-	-	.03
F	Artemisia dracunculus	14	5	.53
F	Castilleja linariaefolia	-	-	.01
F	Comandra pallida	40	15	.42
F	Cryptantha spp.	28	10	.25
F	Descurainia pinnata (a)	26	14	.09
F	Dithyrea wislizeni (a)	28	14	.89
F	Draba spp. (a)	3	2	.01
F	Eriogonum cernuum (a)	92	33	.63
F	Euphorbia spp.	26	11	.05
F	Gilia spp. (a)	15	6	.13
F	Lappula occidentalis (a)	5	2	.01
F	Oenothera albicaulis (a)	40	15	1.77

Type	Species	Nested Frequency '98	Quadrat Frequency '98	Average Cover % '98
F	Oenothera pallida	144	56	5.56
F	Sphaeralcea parvifolia	7	2	.01
F	Astragalus spp.	40	18	1.77
Total for Annual Forbs		209	86	3.55
Total for Perennial Forbs		299	117	8.66
Total for Forbs		508	203	12.22

BROWSE TRENDS --
Herd unit 29R, Study no: 3

Type	Species	Strip Frequency '98	Average Cover % '98
B	Artemisia filifolia	0	.15
B	Artemisia tridentata tridentata	60	4.83
B	Cercocarpus montanus	0	-
B	Chrysothamnus nauseosus albicaulis	1	.15
B	Ephedra viridis	9	1.50
B	Eriogonum nummulare	0	.00
B	Juniperus osteosperma	1	4.40
B	Opuntia spp.	7	.03
B	Pinus edulis	-	.66
B	Purshia tridentata	1	.15
B	Tetradymia canescens	2	1.62
B	Yucca spp.	0	-
Total for Browse		81	13.52

CANOPY COVER --
Herd unit 29R, Study no: 3

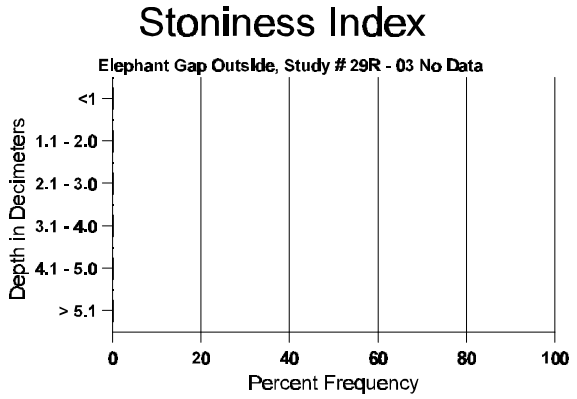
Species	Percent Cover '98
Juniperus osteosperma	4
Pinus edulis	1

BASIC COVER --
Herd unit 29R, Study no: 3

Cover Type	Nested Frequency '98	Average Cover % '98
Vegetation	341	28.61
Rock	5	.01
Pavement	23	.08
Litter	466	38.06
Cryptogams	205	10.76
Bare Ground	418	46.34

SOIL ANALYSIS DATA --
Herd Unit 29R, Study # 03, Study Name: Elephant Gap Outside

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
25.9	69.0 (17.7)	5.4	90.7	2.7	6.6	1.3	3.5	51.2	.1



PELLET GROUP FREQUENCY --
Herd unit 29R, Study no: 3

Type	Quadrat Frequency '98
Rabbit	7
Deer	45
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 29R, Study no: 3

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia filifolia																		
S	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	32	32	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Artemisia tridentata tridentata																		
S	98	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
Y	98	9	1	-	1	-	-	-	-	-	11	-	-	-	220			11
M	98	21	6	-	1	2	-	1	-	-	31	-	-	-	620	42	44	31
D	98	16	11	2	4	1	-	-	-	-	13	-	-	21	680			34
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	980			49
% Plants Showing '98				Moderate Use 28%			Heavy Use 03%			Poor Vigor 28%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		1520	Dec:		45%
Cercocarpus montanus																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	24	25	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Chrysothamnus nauseosus albicaulis																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	45	61	0
D	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%			Poor Vigor 00%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		100%
Ephedra viridis																		
Y	98	4	-	-	3	-	-	-	-	-	7	-	-	-	140			7
M	98	3	2	-	1	-	-	-	-	-	6	-	-	-	120	41	83	6
D	98	1	2	-	-	-	-	-	-	-	2	-	-	1	60			3
X	98	-	-	-	-	-	-	-	-	-	-	-	-	-	80			4
% Plants Showing '98				Moderate Use 25%			Heavy Use 00%			Poor Vigor 06%					%Change			
Total Plants/Acre (excluding Dead & Seedlings)													'98		320	Dec:		19%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Eriogonum nummulare																		
S	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	36	49	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-
Juniperus osteosperma																		
M	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20	-	-	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Opuntia spp.																		
Y	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	98	7	-	-	-	-	-	-	-	-	7	-	-	-	140	4	12	7
D	98	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 11%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		180	Dec:		11%
Purshia tridentata																		
M	98	-	-	1	-	-	-	-	-	-	1	-	-	-	20	11	26	1
% Plants Showing '98				Moderate Use 00%			Heavy Use 100%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		20	Dec:		-
Tetradymia canescens																		
M	98	1	-	-	-	-	-	-	-	-	1	-	-	-	20	58	65	1
D	98	-	-	-	1	-	-	-	-	-	1	-	-	-	20			1
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		40	Dec:		50%
Yucca spp.																		
M	98	-	-	-	-	-	-	-	-	-	-	-	-	-	0	29	28	0
% Plants Showing '98				Moderate Use 00%			Heavy Use 00%				Poor Vigor 00%					%Change		
Total Plants/Acre (excluding Dead & Seedlings)													'98		0	Dec:		-

ELEPHANT GAP EXCLOSURE COMPARISON SUMMARY

Total Exclosure 29R-1, Livestock Exclosure 29R-2, and Outside 29R-3

1998 Comparisons

Soil conditions are very similar between grazing effects. The soil is deep with a sandy texture and a slightly acidic to strongly acidic pH (5.4 to 6.2). Phosphorus and potassium appear to be limiting to plant growth and development on all sites, with some values well below 10 ppm for phosphorus and 70 ppm for potassium. Organic matter is low in the exclosures and higher outside. Percent bare ground is high on all sites, but highest outside of the exclosure at 46% compared to 35% in the livestock and 38% in the total exclosure. Vegetation cover is highest in the livestock exclosure with similar amounts outside and in the total exclosure. Cryptogamic crusts are abundant outside and in the livestock exclosure at 11% and 12% respectively, however it is low at only 5% inside of the total exclosure. Average soil temperatures are high on all sites ranging from 69°F outside of the exclosure to about 71°F in the livestock and total exclosure. This condition causes rapid soil drying in the surface horizons which limits establishment of shallow rooted plants. Soil erosion on all treatment effects appears to be minimal due to the levelness of the terrain, combined with the high infiltration capacity of the soil.

The key browse species for all grazing effects is basin big sagebrush, green ephedra, and antelope bitterbrush. Sagebrush appears to have a stable population within the total exclosure due to good reproduction, normal vigor on most plants, and low decadence at 19%. Dead plants are fairly abundant, although they represent only 30% of the population. The livestock exclosure and outside the exclosure have similar sagebrush populations which appear to be in a state of decline. Sagebrush in the livestock exclosure display poor reproduction and high decadence at 46%. In addition, dead plants are common and represent 48% of the population. Also, nearly half (46%) of the decadent plants were classified as dying. The sagebrush population is in a similar condition outside of the exclosure. However, reproduction is better yet still not enough to maintain the current population levels. If recruitment does not improve, then the population will decline. It should be noted that sagebrush are more susceptible to winter injury than any other shrub species occurring on the site. This injury is caused when the shrub is under extended periods of drought stress, which is intensified by the high percentage of sand in the soil and the depth of the soil. When they are under this kind of stress, and in conjunction with mild winters, they would break dormancy and begin growth very early in the year. Doing so, any substantial length of time with very cold night time temperatures will cause desiccation and death within the shrub crowns for there is no available moisture within the deep sandy soil to carry out photosynthesis. This effect would be aggravated by moderate duel use on the outside of the exclosure, causing even higher death rates and higher rates of decadency.

Green ephedra appears to have an increasing population due to high numbers of young plants at 25% in the total exclosure, 53% in the livestock, and 44% outside. Density is highest within the livestock exclosure at 1,060 plants/acre, compared to 320 outside, and 160 in the total exclosure. These shrubs display light to moderate use and are quite large in the livestock exclosure and outside with mature plants measuring 3 ½ to 4 feet in height.

Antelope bitterbrush is probably the most preferred shrub on the site. It occurs in moderate densities in the total exclosure at 240 plants/acre. This population is mostly mature (92%), vigor is good, and percent decadence is low at only 8%. Very few bitterbrush were found inside the livestock exclosure or outside the exclosure. In the livestock exclosure only one mature and two young, lightly utilized plants were sampled. Outside, only one stunted, heavily hedged mature plant was encountered.

The herbaceous understory is limited on all grazing effects, likely due to the soil conditions. Total herbaceous cover is 6% in the total exclosure, 13% in the livestock exclosure and 14% outside. Grass composition is similar between all sites, with the most common grasses consisting primarily of the warm

season grasses, blue grama and sand drop seed. Annual grasses, cheatgrass and six weeks fescue, are present yet only six weeks fescue is moderately abundant outside of the exclosure. Forb composition is similar between treatment effects with respect to the dominant species, but more species are found in the livestock exclosure and outside (18 and 16 species). In addition, forb cover is 3 times higher in both the livestock exclosure and outside the exclosure. The most abundant species on all sites consist of pale evening primrose, prairie evening primrose, bastard toadflax, and milkvetch.